

FELT TIP FRIENDS

What happens as the water moves up the towel/paper?

Do different coloured pens behave the same way?



Equipment required:

Kitchen roll

Felt tip pens

Paper

Scissors

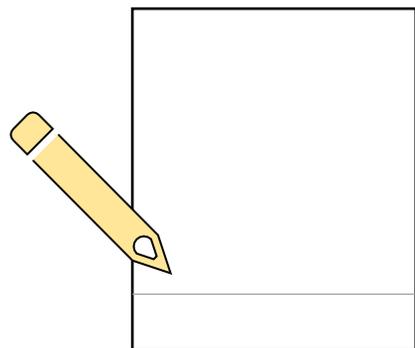
Glue

Glass/beaker

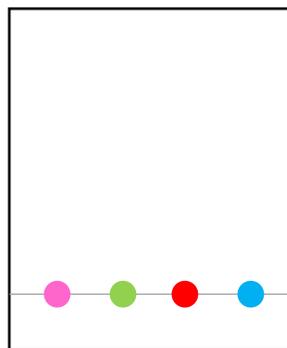
Water

Extra decorations

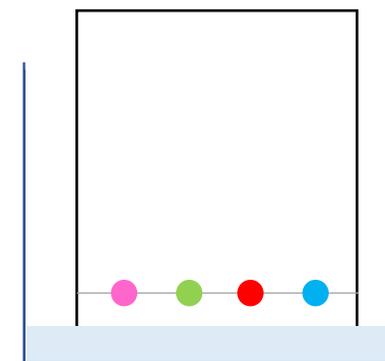
1 Draw line in pencil on kitchen towel.



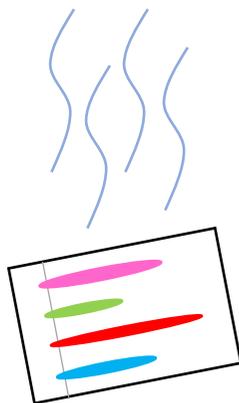
2 Draw small circles from different felt tips along pencil line.



3 Place kitchen towel in container of water. Leave.



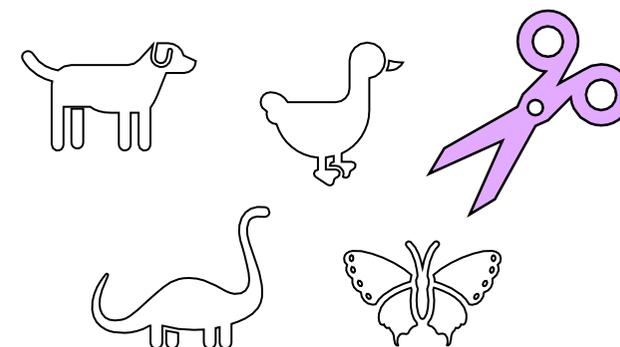
4 Leave colourful kitchen towel to dry.



5 Glue kitchen towel onto some paper for support.



6 Cut out and create your chromatography friends!

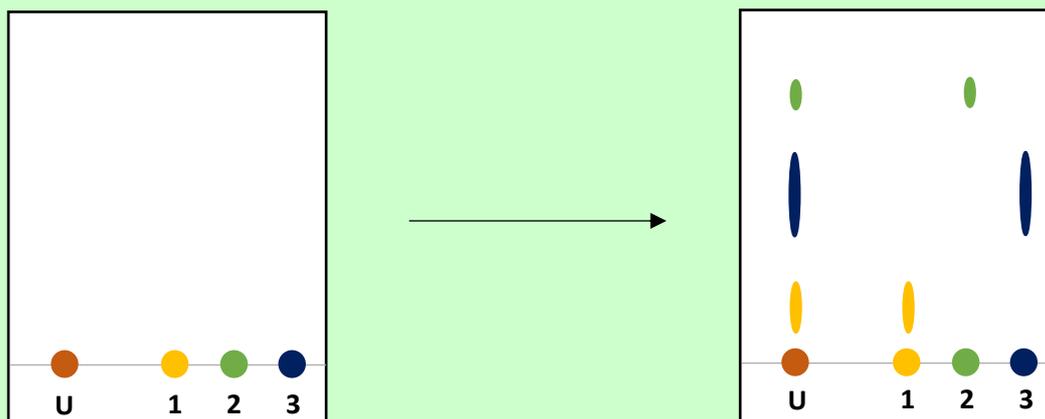


The science behind the scenes...

Chromatography is a technique used to **separate mixtures** of different components, such as inks and dyes. Inks, like in felt tips, consist of a mixture of different molecules, which together produce the overall colour. The different molecules have slightly different properties, which we use to separate them!

Ink molecules **dissolve** in water. When water travels up the paper towel, it dissolves the ink molecules, so the ink that began on the towel moves with the water up the towel. Some molecules dissolve more easily than others do. The better the molecules are at dissolving in water, the longer they stay in the water solution for, and the further the water carries the ink molecule up the paper. This is how we see a **separating** of molecules in chromatography, as different molecules stay dissolved in the solution for a different amount of time.

Chromatography is useful to **compare** an unknown sample (U) to known molecules (1,2,3) to deduce the composition of an unknown mixture.



Note: A **pencil** line is used in setting up a chromatogram as the pencil graphite is **insoluble** (does not dissolve in water) so will not affect the separation. Pen ink dissolves in water, so if pen is used, the ink from the pen will dissolve and mix with the samples being tested!

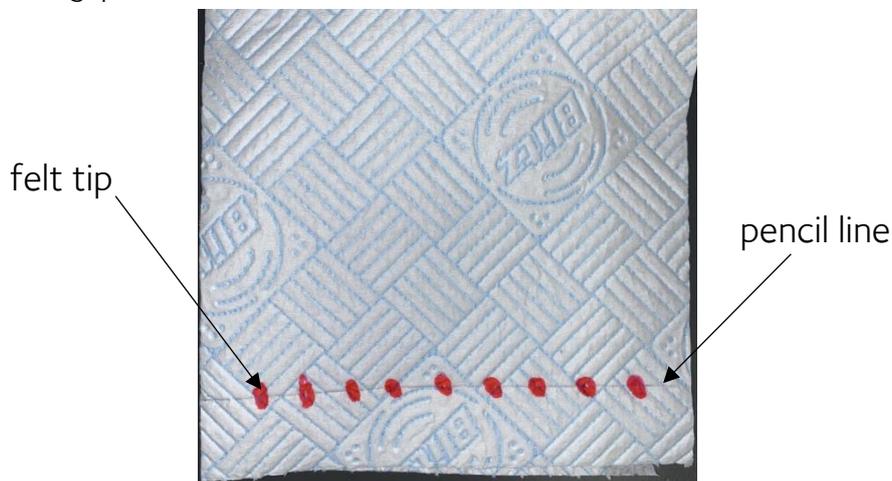
Practical investigation:

Equipment:

- | | |
|--|--|
| <input type="checkbox"/> Kitchen roll | <input type="checkbox"/> Scissors |
| <input type="checkbox"/> Felt tip pens | <input type="checkbox"/> Glue |
| <input type="checkbox"/> Paper | |
| <input type="checkbox"/> Glass/beaker | <input type="checkbox"/> Extra decorations |
| <input type="checkbox"/> Water | |

Method:

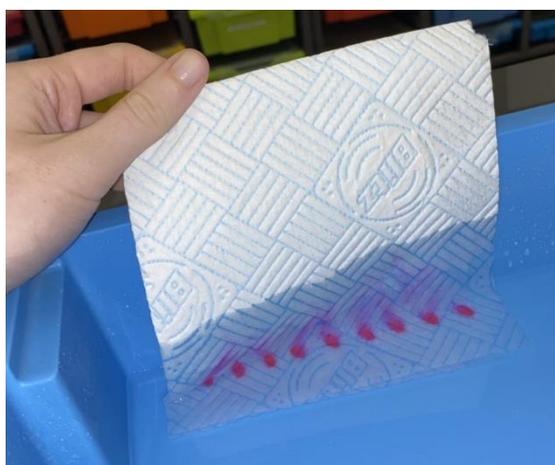
1. Draw a faint pencil line (for a guide) roughly 2 cm above the paper edge.
2. Colour solid circles in different coloured felt tips along the pencil line, making sure there is a gap between each circle.



3. Carefully place the towel in a container filled with water to a depth of approximately 1 cm. Make sure the water does not go over the pencil line when placed in the container.



4. Watch as the water moves up the towel and dissolve the ink as it moves up.



5. Once the water has travelled far enough up the towel, carefully remove and leave to dry.
6. Once dried, glue down the kitchen towel onto a piece of paper for support.
7. Use scissors to cut out and make your chromatography friends!

Questions:

- (a) What can you see as the water moves up the paper?
[As the water moves up the paper/towel, the ink moves with it as it is dissolved in the water, so the ink spreads across the towel.]
- (b) Do all the pens you used produce the same pattern? Why might they be different?
[Different coloured pens will have different compositions of inks, and therefore will be separated differently.]

Science isn't just useful in the labs...

Chromatography isn't just useful in making ourselves some colourful friends- it has many uses in everyday life.

Ever wondered how your favourite drink manages to get the flavour the same in each different bottle? Many different manufacturers use chromatography to check that the contents in each batch are the same so that we can rely on good **quality**, consistent taste!

Professional sport is another area in which chromatography is used. Athletes are **drug tested** to make sure they are not using performance enhancing drugs which would give them an unfair advantage. Chromatography can identify different components in the bloodstream, so it will be able to detect any banned drugs.

