

HOW BLACK IS A BLACK PEN?

Inside many black pens is a rainbow of colour trying to get out. Black ink is often made from a blend of other colours. In this activity you can try out paper chromatography to separate this mixture of inks.

Equipment

- Filter papers
- Black felt-tip pens (Berol Colourbroad works well)
- Plastic cups
- Water
- Dropping pipettes
- Paper towels
- Bin bag
- Scissors

The activity

1. Get participants to draw spots, lines or other simple patterns on a filter paper circle.
2. Balance the filter paper on top of a plastic cup to catch any drips.
3. Use a pipette to drip water onto the spots/lines and watch the colours separate

Top Tip: Encourage participants to add water one drop at a time and allow it to spread out before adding more.

Extension: Filter papers can be cut into 'snowflakes' or other shapes before adding pen spots

Safety: Make sure any spills are mopped up promptly

The science

Chromatography is used to separate mixtures of different molecules. Black ink is often made from a mixture of other colours. The inks dissolve in the water and then move through the paper at different rates, separating out into coloured bands. How far the inks move depends on how they 'partition' between the solvent and the paper – *i.e.* whether they are more chemically attracted to the water or the paper. This is determined by how soluble a given compound is in the solvent (water) and how strongly it binds to the cellulose in the paper via intermolecular bonding (e.g. Van der Waals or hydrogen bonding). Something which is very soluble, but binds weakly to cellulose will travel further than something which is less soluble, but more chemically attracted to the paper.

