

# Funny felt pens

You can buy felt pens which show one colour when used normally, but give a second colour when you go over them with a "magic pen".

## - Your task

Find out how these pens work, using paper chromatography.

Based on a suggestion by C.H. Johnson.

## Time

70 minutes.

## Group size

2–3.

## Equipment & materials

Eye protection.

### General

A range of apparatus for the commonly used paper chromatographic techniques: Stopped boiling tube into which filter paper strip can be inserted, beakers (100 cm<sup>3</sup>), petri dishes, glass droppers, scissors, paper clips, pencil and ruler (measuring to mm).

1 packet of 'Funny' felt pens – many branded and non-branded ones are available – any that change colour when you go over them with the magic pen should work

Whatman grade 1 chromatography paper (100 m roll, 30 mm wide) –

(Alternatively ordinary filter paper may be used.)

Solvents: Water, ethanol, propanone (acetone), salt solution [a 0.1 wt% salt (NaCl) solution has been used as a solvent to separate food dyes by paper chromatography].

## Safety notes

This is an open-ended problem solving activity, so the guidance given here is necessarily incomplete. Teachers need to be particularly vigilant, and a higher degree of supervision is needed than in activities which have more closed outcomes. Students must be encouraged to take a responsible attitude towards safety, both their own and that of others. In planning an activity students should always include safety as a factor to be considered. Plans should be checked by the teacher before implementing them.

You must always comply with your employer's procedures and in some cases may decide that a particular activity is inappropriate in your situation. Further information on Health and Safety should be obtained from reputable sources such as CLEAPSS [<http://science.cleapss.org.uk>] in England, Wales and Northern Ireland and, in Scotland, SSERC [<https://www.sserc.org.uk/>].

No naked flames.

Propanone (acetone) is highly flammable and an eye/respiratory irritant.

Ethanol is highly FLAMMABLE (if methylated spirits are used, they are also harmful if ingested and cause damage to organs).

It is the responsibility of the teacher to carry out a suitable risk assessment.

Wear eye protection.

## Curriculum links

Chromatography, acids and alkalis, indicators, dyes, polar/non-polar solvents.

## Possible approaches

Paper chromatography of the coloured pens. Colour changes are due to pH changes of dyes/indicators (Vogel's Textbook of "Quantitative Inorganic Analysis" Fourth edition, p240-241 gives a good list of indicators). The "Magic" pen contains alkali. One approach might be to separate colours from a "funny" felt pen using paper chromatography, then dry the chromatogram (a hairdryer is handy) and dab the 'magic' pen on the separated colours to see which of the colours it affects.

- Perhaps put out acid and alkali as resource chemicals as a hint to lead students into thinking that the problem involves acid/base chemistry.

## Extension work

Students could try to identify the names of indicators in each pen – question involving pH charts.

Are 'ordinary' felt pens susceptible to the magic pen?

## Credits

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*Health & safety checked May 2018*

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