Activity Three: Practical Experiment

In this simple experiment, you will use paper chromatography to separate coloured compounds from coloured pens, markers etc.

A spot of the mixture is placed near the bottom of a piece of chromatography filter paper and the paper is then placed upright in a suitable solvent, e.g. water or non-acetone nail polish remover (mixture of isopropyl alcohol, methyl ethyl ketone and ethyl acetate). As the solvent soaks up the paper, it carries the mixtures with it. Different components of the mixture will move at different rates. This separates the mixture out.

Note: It is important to use filter paper as normal paper will not adsorb water. (try it yourself)

'Do it at home' chromatography experiment:

Items required:

- Nail polish remover as mobile phase (can be replaced with water or rubbing alcohol if unavailable),
- Coffee filter paper as the stationary phase (a paper kitchen towel would also be suitable) trimmed to sizes described below.
- Marker pens or coloured pens as the analytes.
- Glass of a minimum height of 11 cm.

Health and safety considerations:

1. Work in a large room/well ventilated area.
2. Nail polish remover – do not breathe in vapours. After you have finished working, pour the remaining nail polish remover back in its original container, do not throw it down the sink!
3. Wash the glass thoroughly with water and soap.

Steps:

1. Cut the filter paper/ kitchen towel to an approximate size of 5cm x 10cm.
2. Draw a base line – approx. 1 cm above the bottom of the paper.
3. Make some spots on the line using different colours and pens. (about 1cm apart at minimum)
4. Attach the paper to a pencil using a foldback clip.
5. Add nail polish remover or water in the glass so that when the paper dips in, the spots are NOT touching the liquid. (*i.e.* about 0.5-0.75cm deep)
6. Leave it to develop for a few minutes being careful not to leave it so long that the solvent reaches the top of the paper. Draw a line to show how far the solvent front has reached then calculate the R_f. (Reminder: R_f = distance traveled by the solvent front/distance traveled by analyte)

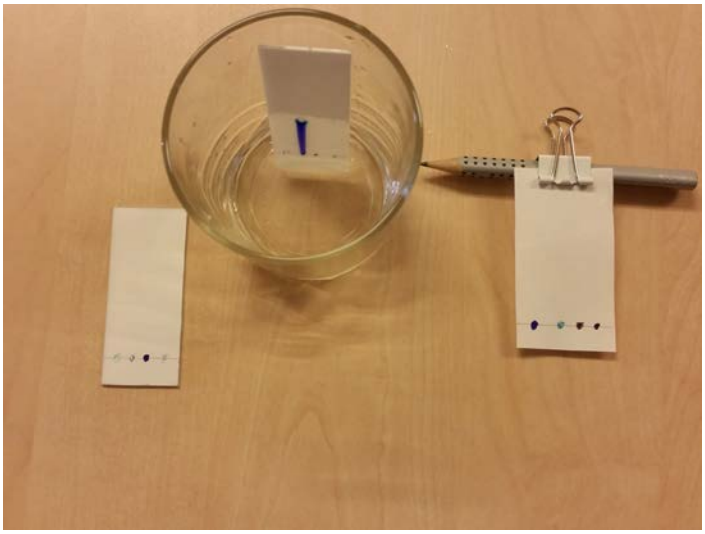

Figure 1. Prepare the paper as described in points 1,2 and 3.

Figure 2. Paper chromatography using water as solvent. Add the solvent/water to your glass and set up the paper as described in point 5

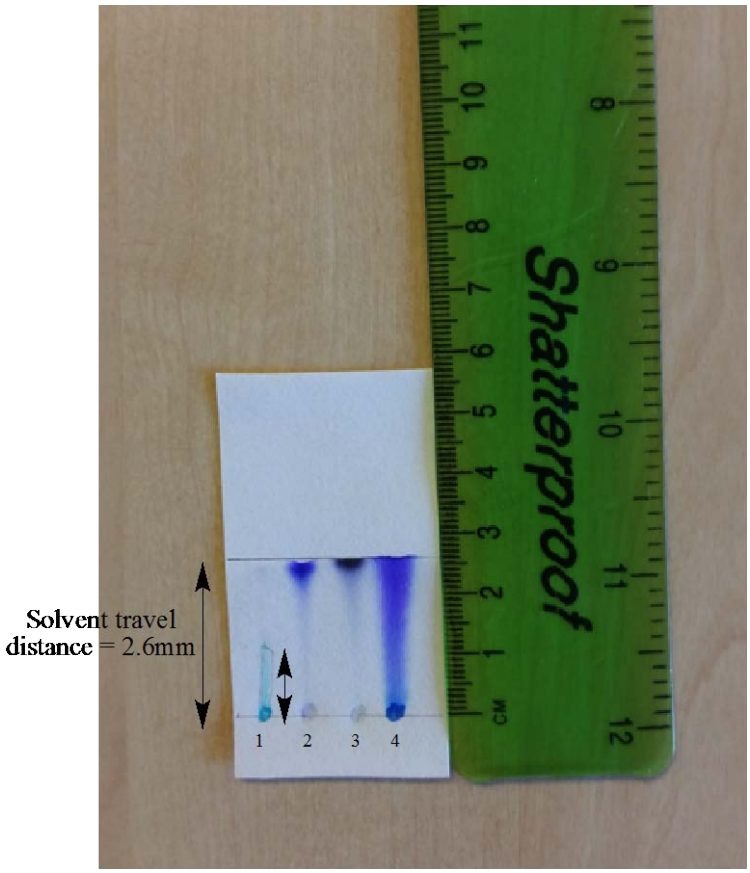

Figure 3. Measure the R_f of each spot as described in point 6. The R_f of the light blue streak (mixture 1) would be: 1cm/2.6cm=0.38 (if the pen streaks, just measure from the top of the streak)

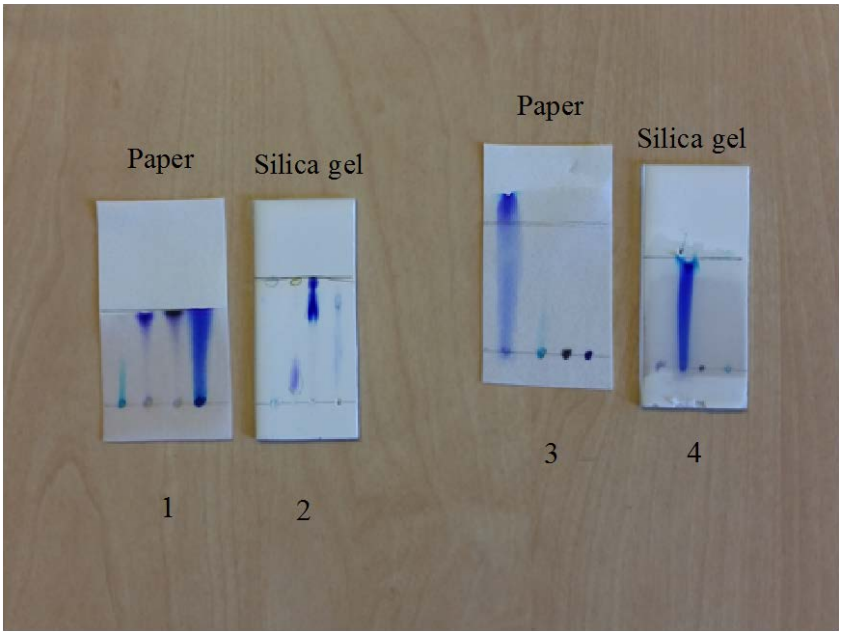

Figure 4. The effect of solvents on analyte movement. The paper and silica gel on the left (1 and 2) were run using nail polish remover and the two on the right (3 and 4) were run using water (same analyte spots in each case). Note that the paper chromatography continued to develop after the run was stopped hence solvent continued to pass the pencil solvent front (paper 3). Also note that the silica gel plate 2 run using nail polish remover shows better separation thus you can identify more compounds. Can you notice the yellow spot?