

C12 Experimental techniques and chemical analysis

C12.2 Chromatography

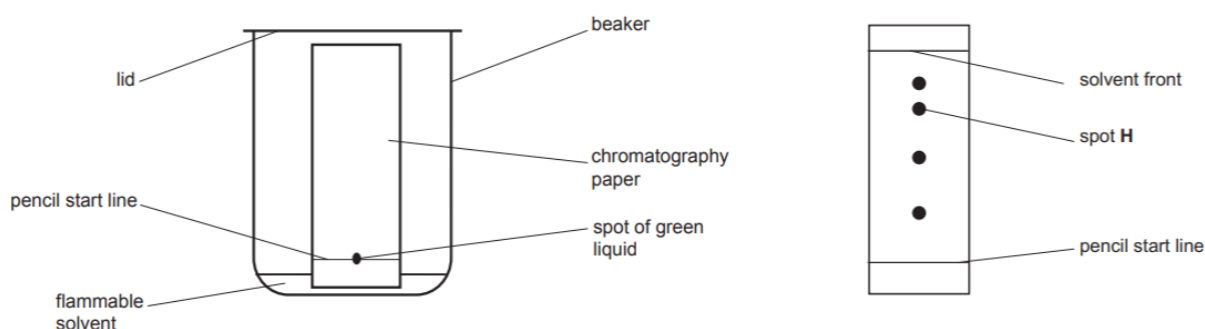
Describe how paper chromatography is used to separate mixtures of soluble coloured substances, using a suitable solvent

- Paper chromatography separates mixtures of soluble coloured substances by allowing them to travel at different rates on a paper with a solvent.

Interpret simple chromatograms to identify:

- (a) unknown substances by comparison with known substances
- (b) pure and impure substances

- To interpret chromatograms:
Compare spots from unknown substances with known ones - matching spots indicate identical substances.
A pure substance produces a single spot, while an impure substance results in multiple spots at different levels.



- The start line needs to be drawn in **pencil**; if it was drawn in anything soluble it would also travel up the paper with the spot of green liquid. The spot of green liquid could be put on the paper using a **pipette** (dropper).
- The line and the spot need to be above the level of the **solvent** or the spot would just dissolve in the solvent and not climb up the paper.
- The green liquid is made up of four different coloured substances (as there are 4 separate spots). If there were any colourless substances in the green liquid we would not know as we cannot see them!
- The **lid** is a safety precaution: the student should keep the experiment away from naked flames / put lid on it immediately / use the fume cupboard / do in a well-ventilated area *because* the solvent is flammable / evaporates easily / is volatile.

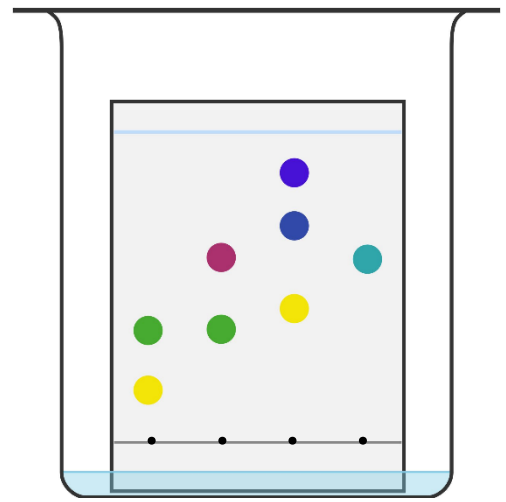
Supplement

State and use the equation for R_f : $R_f = \frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$

- Both measurements are made from the start line / pencil line.
- If a spot travels 3.2 cm from the pencil line, and the solvent travels 4.4 cm from the same line, then the R_f value is $3.2 \div 4.4 = 0.7272$; The answer to 2 significant figures is $R_f = 0.73$

Four inks (A-D) were analysed

- Inks A and B are made up of two different coloured substances. Ink C is made up of three different coloured substances. They are mixtures.
- Ink D is a pure substance – made up of only one coloured substance
- The green coloured substance is A and B is the same substance as they have travelled exactly the same distance BUT the yellow substances in A and C are different (as they have travelled different distances in the same time).
- The most soluble coloured substance is the purple substance (in ink C) as it travelled furthest.



A B C D