GCSE Edexcel

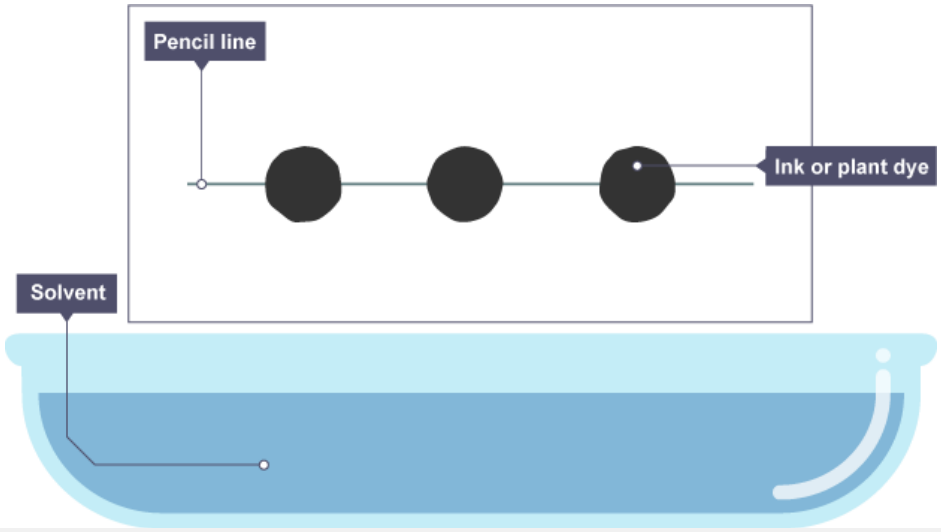
Separation and purification

There are different ways to separate mixtures, for example by filtration, crystallisation, distillation or chromatography. The method chosen depends upon the type of mixture.

Part of Chemistry (Single Science) | States of matter and mixtures

Paper chromatography

Paper **chromatography** is used to separate mixtures of **soluble** substances. These are often coloured substances such as food colourings, inks, dyes or plant pigments.



Paper chromatography

1. Water and ethanol solution is heated

Phases

Chromatography relies on two different 'phases':

- the **stationary phase**, which in paper chromatography is very uniform, absorbent paper

- the **mobile phase** is the **solvent** that moves through the paper, carrying different substances with it

The different **dissolved** substances in a mixture are attracted to the two phases in different proportions. This causes them to move at different rates through the paper.

Interpreting a chromatogram

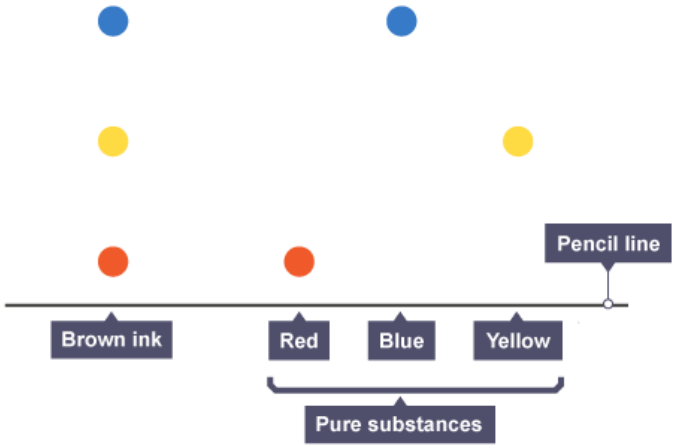
Separation by chromatography produces a **chromatogram**.

A paper chromatogram can be used to distinguish between **pure** and impure substances:

- a pure substance produces one spot on the chromatogram
- an impure substance produces two or more spots

A paper chromatogram can also be used to identify substances by comparing them with known substances. Two substances are likely to be the same if:

- they produce the same number of spots, and these match in colour
- the spots travel the same distance up the paper (have the same R_f value)



Interpreting the chromatogram for a brown ink

In this chromatogram, the brown ink is made of a mixture of the red, blue and yellow inks. This is because the spots in the brown ink are at the same heights (and have the same R_f value) as the reference inks.

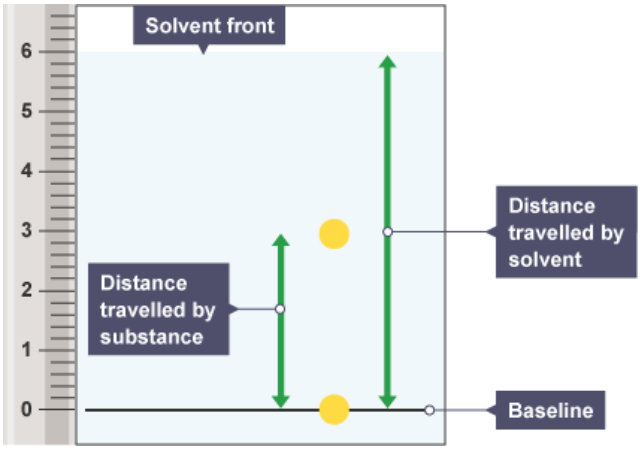
R_f values

R_f values can be used to identify unknown chemicals if they can be compared to a range of reference substances. The R_f value is always the same for a particular substance.

The R_f value of a spot is calculated using:

$$R_f = \frac{distance\ travelled\ by\ substance}{distance\ travelled\ by\ solvent}$$

R_f values vary from 0 (the substance is not attracted at all to the mobile phase) to 1 (the substance is not attracted at all to the stationary phase).



Measurements needed in the formula

Glossary

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