C12: Chemical Analysis

Purity

A substance that contains only one compound or element.

Can be tested for by measuring the **melting or boiling point** of a substance and comparing to a known value for the pure substance.

Impurities will lower the melting point and increase the boiling point.

Formulations

Mixtures with a precise purpose made up by following a recipe (formula).

Are important for producing drugs – they must be at exactly the right concentration.

Found in cleaning products – the ratio or percentage of each component will be given on the label.

Tests for gases

Oxygen – place glowing splint in test tube. Will relight if oxygen present.

Carbon dioxide – bubble through limewater (calcium hydroxide). Will turn cloudy if CO_2 present.

Hydrogen – hold a lit split at the end of a test tube. Will produce a squeaky pop if hydrogen is present.

Chlorine – will bleach damp litmus paper, making it turn white (it will briefly turn red first as chlorine is acidic)

Paper Chromatography – technical terms

Separates substances in a mixture, such as inks in a pen. There are two phases:
- **Mobile phase**: the molecules are able to move (always a liquid or gas)
  - this is the solvent (often water or ethanol)
- **Stationary phase**: the molecules can't move (a solid or very thick liquid)
  - the paper

The mobile phase, including anything dissolved in it, moves through the stationary phase.

The chemicals that spend more time in the mobile phase than the stationary phase will move further up the stationary phase – ie. they will move further up the paper. The amount of time molecules spend in each phase is affected by:
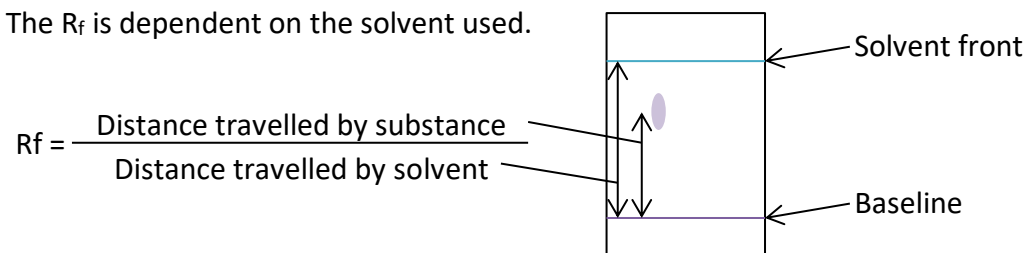- how **soluble** they are in the solvent (more soluble = move further)
- how **attracted** they are to the paper (less attracted = move further)

Calculating R_f values

The R_f is a ratio between how far the dissolved substances move and the distance the solvent moves.

If the R_f of two substances match they are likely to be the same substance.

The R_f is dependent on the solvent used.

$$Rf = \frac{\text{Distance travelled by substance}}{\text{Distance travelled by solvent}}$$

Solvent front

Baseline

To find out if a chemical is in a mixture:

A **pure** sample (called the **reference**) is run against an unknown mixture in a number of different solvents.

If the R_f of the pure sample matches one of the spots in the mixture in all the different solvents it is likely the reference compound is present in the mixture.

If the R_f values are only the same in some solvents then the reference compound is not in the mixture.