C8 – Chemical Analysis

Pure substances

Pure = single element or compound – not mixed with any other substance.

Testing to see if a substance is pure:
- Pure substances have specific melting and boiling points

- Compare your data to a library of known values.

E.g. Water has a boiling point of 100°C, if it is above or below this, it is not pure.

Formulations

Formulation = a mixture that is designed as a useful product.

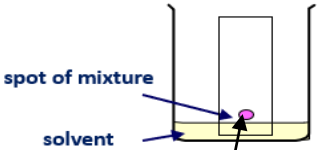
- Components mixed carefully to get the required **properties**.

Examples of formulations:
- Fuels
- Cleaning agents
- Paints
- Medicines
- Alloys
- Fertilisers
- Food

Chromatography

- Technique used to separate mixtures of **soluble substances**.
- How soluble a substance is determines how far it travels across paper.

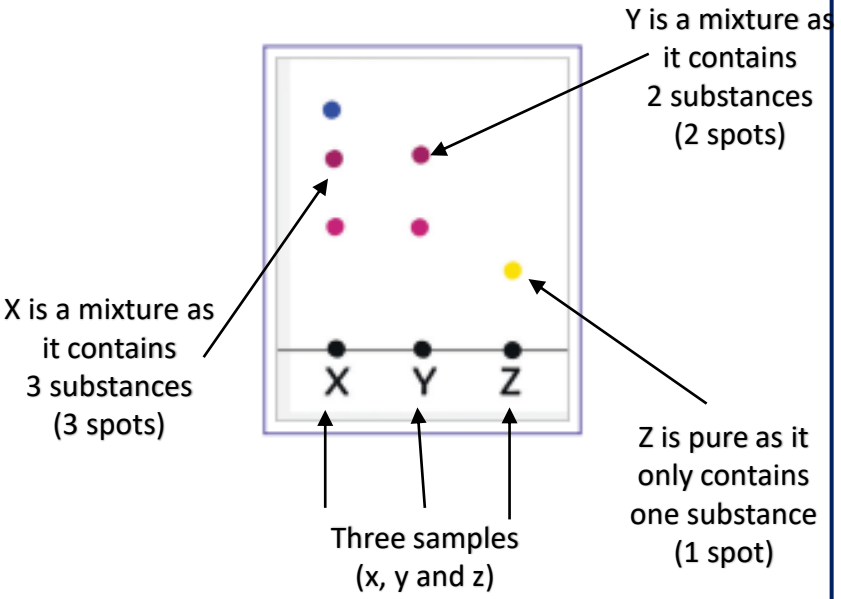
More soluble = travels further (higher up paper)



Mobile phase
- **Solvent** is the mobile phase
- The substances dissolve in the solvent
- The solvent then moves through the stationary phase.

Stationary phase
- Does not move. The paper is the stationary phase.

Important – start line on paper must be drawn in **pencil** as pencil is **insoluble** and **will not run**
The spot and start line must be **above the solvent line** so the colours won't just wash into the solvent in the beaker.



Rf Values

This is the ratio of the distance moved by a substance to the distance moved by the compound

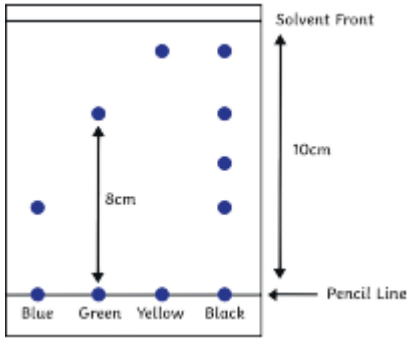
$$R_f = \frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$$

- Should always be between 0 and 1.

- Each substance has a unique Rf value.

- Can compare Rf values to a library of known substances

- Can identify unknown substances.



Rf value of green:

8cm / 10cm = 0.8

C8 – Chemical Analysis

Required Practical – Paper Chromatography

Aim: Investigate how paper chromatography can be used to separate and distinguish between coloured substances.

Method

1) Using a ruler, measure 1cm from bottom of chromatography paper and draw a line across the paper with a **pencil**.

2) Using a pipette, drop small spots of each ink onto pencil line (leave a gap so do not merge).

3) Pour solvent into a beaker, do not fill solvent above the pencil line on the paper.

4) Place chromatograph paper into beaker and allow solvent to move up the paper.

5) Remove paper just before solvent reaches top of the paper and leave to dry.

6) Calculate R_f values of all the spots using the equation below:

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

Common questions

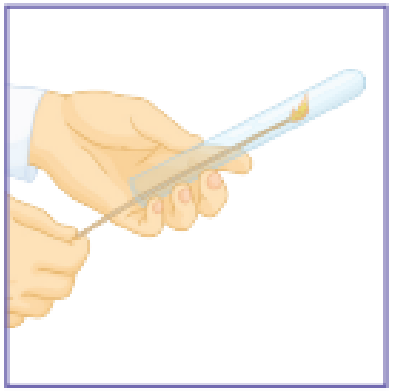
Q1) Why is a pencil used instead of a pen?
A1) Ink in the pen would move up the paper with the substances.

Q2) Why do you not fill the solvent above the line?
A2) Substances would wash off into the solvent instead of rising up the paper

Q3) Why might water not work as a solvent?
A3) Some substances are **insoluble** in water.

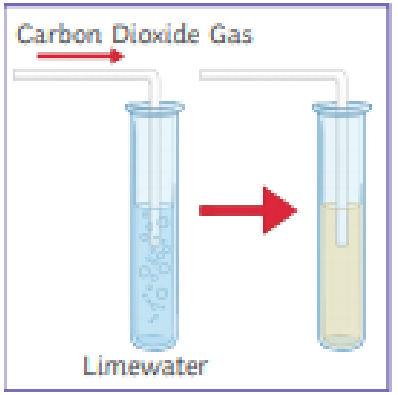
Identification of the Common Gases

Test for hydrogen – Place a **burning** splint at the opening of a test tube. If hydrogen gas is present, it will burn with a **squeaky-pop sound.**



Test for Oxygen – Place a **glowing** splint inside a test tube. The splint will **relight** in the presence of oxygen.

Test for Carbon Dioxide –Bubble the gas through the lime water – if the gas is carbon dioxide, the limewater turns **cloudy**.



Test for Chlorine – **Damp litmus paper** is held over the of gas. If the tube contains chlorine, the litmus paper becomes **bleached** and **turns white**.