Purity and formulations:

Pure substances melts at specific temperatures and also have a specific boiling point

Impure substances melt and boil over a range of temperatures

Formulation = Complex mixture that has been designed as a useful product

In formulations, quantity of each component is measured so that the product has properties we need

Formulations include:

- Fuels
- Cleaning products
- Medicines
- Alloys

Chromatography:

Paper chromatography allows us to separate substances based on their different solubilities

Paper is stationary phase

Solvent is mobile phase

Pure compounds will produce a single spot in all solvents

Compounds in mixtures may separate into different spots depending on the solvent

A compound with higher solubility will travel further up

Why we draw the line in pencil:

- If we drew the line in pen, the pen ink would move up the paper, with the solvent

<u>Required practical – Paper Chromatography:</u>

1. Use a ruler to draw a horizontal pencil line on the chromatography paper, the line should be around 2cm from the bottom of the paper.
2. Mark 5 pencil spots out of equal spaces across the line. Leave at least 1cm clear at each side.
3. Use a capillary tube to put a small spot of each of the known food colours and the unknown colour onto the pencil spots. A capillary tube is simply a very thin glass tube.
4. Now we pull water into a beaker to a depth of 1cm.
5. Attach the paper to a glass rod using tape and we lower the paper into the beaker. The bottom of the paper should dip into the water. Now there are three key points here:

- Firstly, the pencil line with the spot of ink must be above the surface of the water. Otherwise, the water will wash the ink off the line.
- Secondly, the sides of the paper must not touch the sidewalls of the beaker. If that happens, then it will interfere with the way the water moves.
- And lastly, we usually put a lid on the beaker to reduce the evaporation of the solvent.

6. Remove the paper when the waters travels around 3/4 of. At this stage we use a pencil to mark the point where the water reached
7. We hang the paper to dry

$$R_f = \frac{\text{distance moved by chemical}}{\text{distance moved by solvent}}$$

You can look up the R_f value up in a database and that will tell us the identity of the chemical

Several different chemicals may have this R_f value so we may need to repeat this experiment using a different solvent to narrow it down further

If this chemical has not been analysed before then there is no R_f value in the database

Testing for gases:

Test for hydrogen:

- Insert a burning splint into the test tube

- Produces a squeaky pop sound

Test for oxygen:

- Place glowing splint into test tube
- Glowing splint relights

Limewater is an aqueous solution of calcium hydroxide (calcium hydroxide dissolved in water)

Test for Carbon dioxide:

- Draw some gas into plastic pipette
- Bubble gas through limewater
- Limewater will turn cloudy

Test for chlorine:

- Insert damp litmus paper into mouth of test tube
- Chlorine bleaches litmus paper and turns it white