Purity & Formulations:

Pure Substances:

Real life: a substances with nothing added to it e.g. milk

In Chemistry: a substance that contains one element/compound throughout

Pure substances melt & boil at SPECIFIC temperatures
Measure the mp & bp of a substance & compare it to the mp & bp of the pure substance from a data book-> closer value = 'more' pure

Impurities: lower mp & increase range of temps

Impurities: increase bp & increase range of temps

Formulations:
Useful mixtures with precise purposes, using measured quantities to fulfil a function

E.g. medicines (for function & shelf life), paints, fertilisers, cosmetics, fuels

Product's composition found on its packaging using ratios & percentages (1st 'ingredient'= most abundant)

Paper chromatography:

Analytical method used to separate substances in a mixture

Phases: Mobile (the solvent), Stationary (filter paper)- based on particle movement until an equilibrium is formed

Time the substances spend in each phase depends on their affinity/ distribution towards it: their solubility & their attraction to the paper

Higher solubility & lower affinity towards paper = spends more time in the mobile phase so will be carried up further

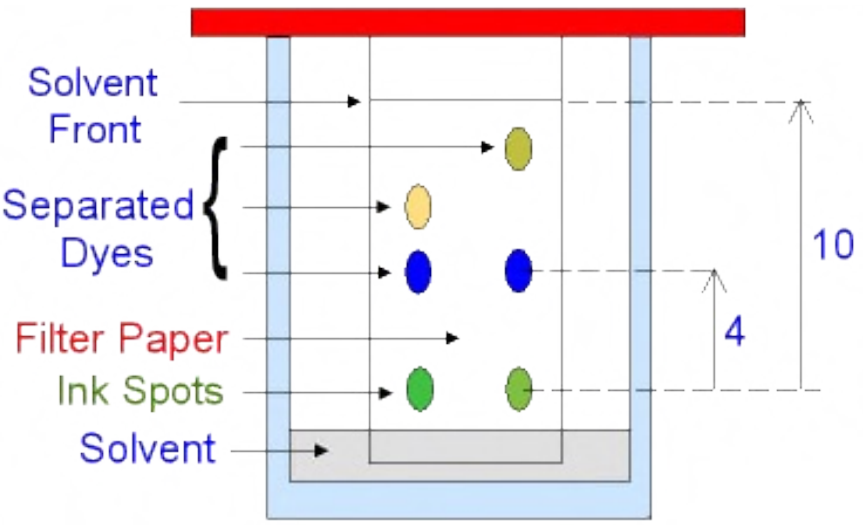
Pure substances: form ONE spot

Chromatograms = result of chromatography analysis

Rf value = distanced travelled by substance (from baseline to centre of spot) / distance travelled by solvent

ALWAYS <1

Test for presence of a substance in a mixture: run pure substance by the mixture & if spots align, the substance is present & should test with different solvents e.g. ethanol or water



Tests for gases & anions:

Common gases:

Chlorine bleaches damp litmus paper white
Oxygen relights a glowing splint in a test tube
Carbon dioxide turns limewater cloudy when bubbled through
Hydrogen makes a squeaky pop when holding a lit splint at the end of a test tube

Anions:

Carbonates = have CO3^-2 ions
Add dilute acid with pipette into test tube (with sample), connect to a tube of limewater. If present, limewater turns cloudy & carbon dioxide released

Sulphates = SO4^-2 ions
Use pipette to add HCL & BaCl^2 to test tube with solution. White precipitate forms if present

Halides:
Add HNO3 & AgNO3

Chloride: white precipitate of silver chloride
Bromide: cream precipitate of silver bromide
Iodide: yellow precipitate of silver iodide

Tests for Cations:

IONS burn with distinct colour FLAMES:

Lithium= crimson
Sodium= yellow
Potassium= lilac
Calcium= red
Copper= green

Method:
Clean platinum wire loop with HCL & hold in blue flame till it burns without colour, then dip loop into sample & put into flame, recording the colour

Only works with samples containing ONE metal ion (mixtures = would hide colours)

Metal hydroxides = insoluble so precipitate out of a solution when formed with distinct colours
Add sodium hydroxide & record colour of flame

Metal Ions	Colour of Precipitate	Ionic Equation for Precipitate Form
Calcium, Ca^{2+}	White	$Ca^{2+}_{(aq)} + 2OH^-_{(aq)} \rightarrow Ca(OH)_2$
Copper(II), Cu^{2+}	Blue	$Cu^{2+}_{(aq)} + 2OH^-_{(aq)} \rightarrow Cu(OH)_2$
Iron(II), Fe^{2+}	Green	$Fe^{2+}_{(aq)} + 2OH^-_{(aq)} \rightarrow Fe(OH)_2$
Iron(III), Fe^{3+}	Brown	$Fe^{3+}_{(aq)} + 3OH^-_{(aq)} \rightarrow Fe(OH)_3$
Aluminium, Al^{3+}	White at first. But then redissolves in excess NaOH to form a colourless solution.	$Al^{3+}_{(aq)} + 3OH^-_{(aq)} \rightarrow Al(OH)_3$
Magnesium, Mg^{2+}	White	$Mg^{2+}_{(aq)} + 2OH^-_{(aq)} \rightarrow Mg(OH)_2$

Flame emission spectroscopy:

Every metal ion gives a specific line spectrum

1. Sample heated
2. Electrons gain energy, then drop back to their original energy level
3. Energy is transferred as light
4. Light passes through the spectroscope which detects different wavelengths (depends on charge & electron arrangement) = produces different line spectrum for each ion

Intensity of light = determines concentration of ion in solution

Can identify ions in mixtures = more useful than flame tests as identify multiple ions

Instrumental analysis pros:

Sensitive
Rapid (automated tests)
Accurate