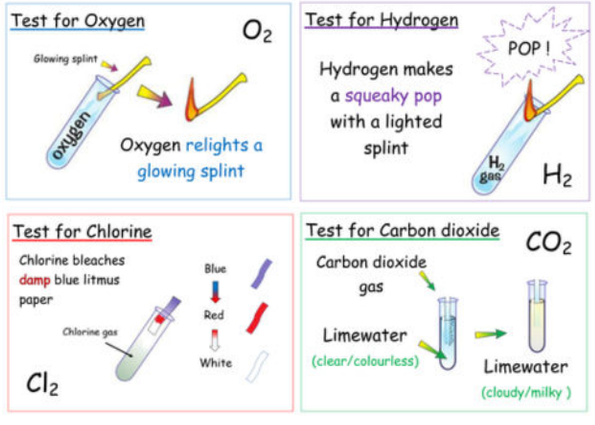
Chemical Analysis

Keyword	Definition
Purity	Is how pure or impure a substance is.
Formulation	A mixture that has been designed to produce a useful product
Impurity	Is when there is another substance that make a pure substance impure.
Insoluble	A substance that does not dissolve in a solvent.
Soluble	A substance that does dissolve in a solvent.
Solvent	The liquid that can dissolve a solute into it.
Precipitate	The solid that is produced during a reaction.
Chromatography	The process whereby small amounts of dissolved substances are separated by running a solvent along
Retention factor	A measurement from chromatography: it is the distance a spot of substance has been carried above the baseline divided by the distance of the solvent front.
Positive ions	An atom that has lost negative electrons to have a positive charge.
Negative ions	An atom that has gained negative electrons to have a negative charge.

C

Ca03 Testing gases

- You can be asked to recall the gas tests in Chemical changes topic as a way to prove what is produced at the electrodes.

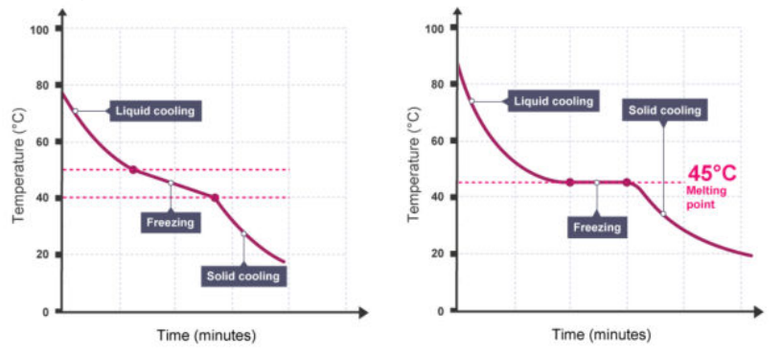


A

Ca01 Purity

Key Point

- An element contains atoms with the same atomic number.
- A compound contains two or more elements chemically joined together.
- A mixture contains two or more different substances that are not chemically joined together. The different substances in a mixture can be elements and/or compounds.
- In Chemistry a pure substance consists only of one element or compound.
- A mixture consists of two or more different substances, not chemically joined together.
- Pure substances have a sharp melting point but mixtures melt over a range of temperatures.



A

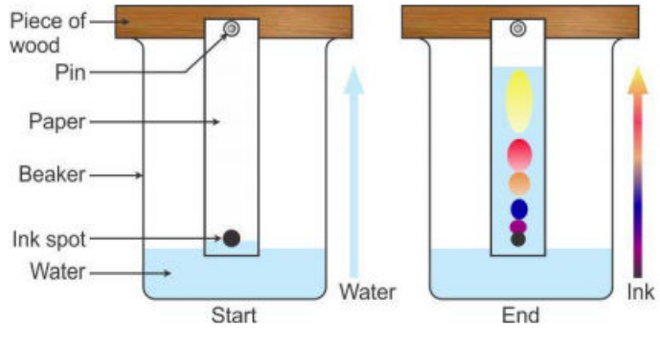
Ca01 Formulation

- A formulation is a mixture that has been designed as a useful product.
- Formulations are made by mixing the components in carefully measured quantities to ensure that the product has the required properties.
- Examples of formulations include fuels, paints, medicines, alloys, fertilisers and food.

A

Ca02 Chromatography RP

- Paper chromatography is a method of separating dissolved substances from one another.
- Separation depends on the distribution of substance between the stationary phase (paper) and mobile phase (solvent such as water or sodium hydroxide).



- The compounds in a mixture may separate into different spots depending on the solvent but a pure compound will produce a single spot in all solvents.
- The ratio of the distance moved by a component to the distance moved by the solvent can be expressed as its R_f value.

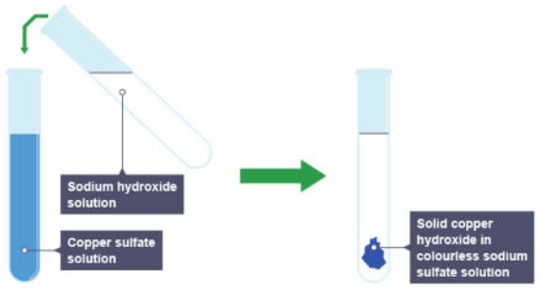
$$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$$

- Different compounds have different R_f values in different solvents.

B

Ca04 Testing for metals with sodium hydroxide (Chem only)

- Some metal hydroxides are insoluble. This means that metal hydroxides appear as precipitates.



Sodium hydroxide solution is added to copper sulfate solution. Solid copper hydroxide is produced in sodium sulfate solution

Different metals produce different colour precipitates when reacted with sodium hydroxide

Metal ion	Precipitate colour
Aluminium, Al^{3+}	White
Calcium, Ca^{2+}	White
Magnesium, Mg^{2+}	White
Copper(II), Cu^{2+}	Blue
Iron(II), Fe^{2+}	Green
Iron(III), Fe^{3+}	Brown

- To distinguish between aluminium, calcium and magnesium then add excess sodium hydroxide.
- Aluminium will dissolve but calcium and magnesium are unchanged.

B

Ca04 Testing for halides (Chem only)

- Group 7 (halide) ions (Cl^-, Br^- or I^-) react with silver ions to form an insoluble precipitate.

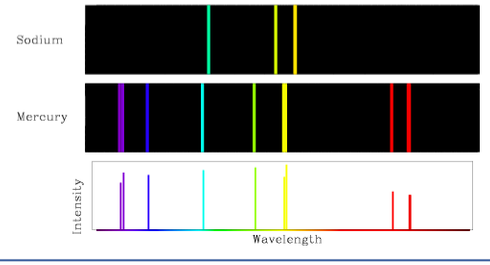
Different halides produce different coloured precipitates.

Halide ion	Precipitate colour
Chloride, Cl^-	White
Bromide, Br^-	Cream
Iodide, I^-	Yellow

B

Ca05 Instrumental Analysis

- Elements and compounds can be detected and identified using instrumental analysis.
- Flame emission spectroscopy is where a sample is put into a flame and the light given out is passed through a spectroscope.
- The spectrum can be compared to identify the metal ion that are present as well as their concentration.



Required Practical:

CC02 Chromatography
CC04 Identifying ions (Chem only)

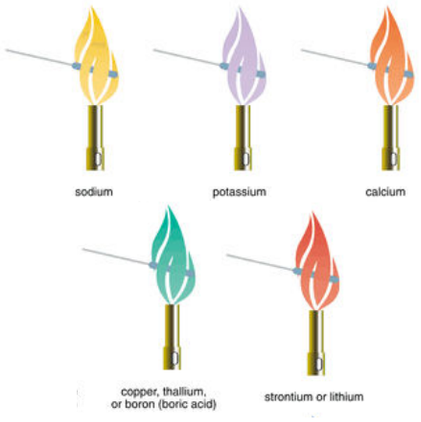
Mathematical Skills:

You may be asked to calculate the R_f value to an appropriate number of significant figures.

B

Ca05 Testing for metal with a flame (Chem only)

- Different metal ions produce different flame colours when they are heated.
- The method involves dipping a wire loop into a sample and then placing it in the blue flame of a Bunsen burner.



B

Ca04 Testing for carbonates (Chem only)

- Carbonate ions (CO_3^{2-}) react with a dilute acid such as hydrochloric acid and produce carbon dioxide bubbles.
- The gas can be collected and passed through Limewater to prove that it is carbon dioxide.

B

Ca04 Testing for sulfates (Chem only)

- Sulfate ions (SO_4^{2-}) react with barium chloride when acidified with hydrochloric acid to produce insoluble barium sulfate.

AQA

Relevant Modules:

- Atomic Structure
- Chemical changes

Useful YouTube links: