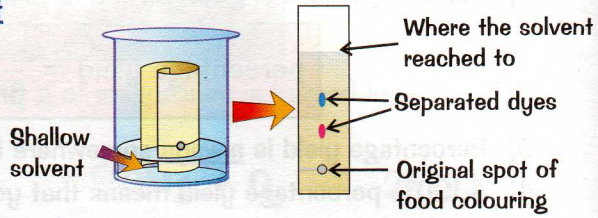
Chemical Analysis and Instrumental Methods

Nowadays there are some pretty clever ways of identifying substances, from using filter paper to machines...

Artificial Colours Can Be Separated Using Paper Chromatography

A food colouring might contain one dye or it might be a mixture of dyes. Here's how you can tell:

1) Extract the colour from a food sample by placing it in a small cup with a few drops of solvent (can be water, ethanol, salt water, etc).
2) Put spots of the coloured solution on a pencil baseline on filter paper. (Don't use pen because it might dissolve in the solvent and confuse everything.)
3) Roll up the sheet and put it in a beaker with some solvent — but keep the baseline above the level of the solvent.
4) The solvent seeps up the paper, taking the dyes with it. Different dyes form spots in different places.
5) Watch out though — a chromatogram with four spots means at least four dyes, not exactly four dyes. There could be five dyes, with two of them making a spot in the same place. It can't be three dyes though, because one dye can't split into two spots.



Machines Can Also Analyse Unknown Substances

You can identify elements and compounds using instrumental methods — this just means using machines.

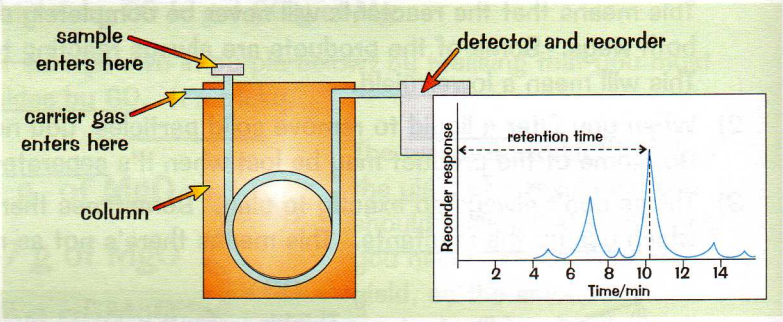
Advantages of Using Machines

- Very sensitive — can detect even the tiniest amounts of substances.
- Very fast and tests can be automated.
- Very accurate

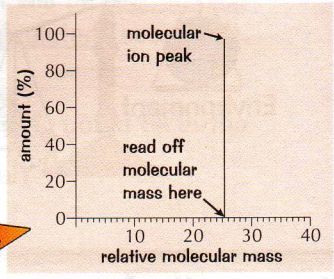
Gas Chromatography Can be Used to Identify Substances

Gas chromatography can separate out a mixture of compounds and help you identify the substances present.

1) A gas is used to carry substances through a column packed with a solid material.
2) The substances travel through the tube at different speeds, so they're separated.
3) The time they take to reach the detector is called the retention time. It can be used to help identify the substances.
4) The recorder draws a gas chromatograph. The number of peaks shows the number of different compounds in the sample.



5) The position of the peaks shows the retention time of each substance.
6) The gas chromatography column can also be linked to a mass spectrometer. This process is known as GC-MS and can identify the substances leaving the column very accurately.
7) You can work out the relative molecular mass of each of the substances from the graph it draws. You just read off from the molecular ion peak.



Unfortunately, machines can't do the exam for you...

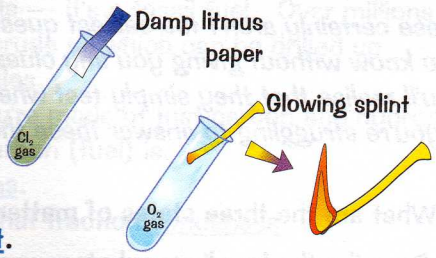
Make sure you don't get the two types of chromatography muddled up... there's paper and then there's gas.

Common Tests and Hazard Symbols

You need to know these SIX EASY LAB TESTS:

1) Chlorine bleaches damp litmus paper

(i.e. it turns it white).

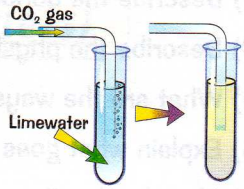


2) Oxygen relights a glowing splint

The standard test for oxygen is that it relights a glowing splint.

3) Carbon dioxide turns limewater milky

Carbon dioxide can be detected by turning limewater cloudy when it's bubbled through.



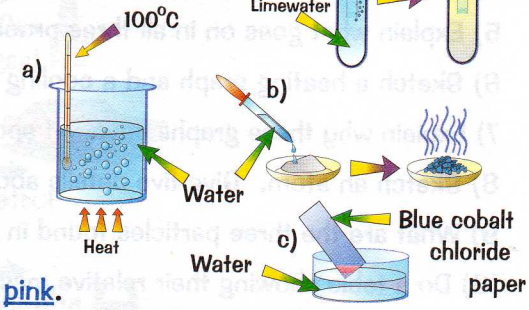
4) The three lab tests for Water

Water can be detected in three ways:

a) by its boiling point of 100°C

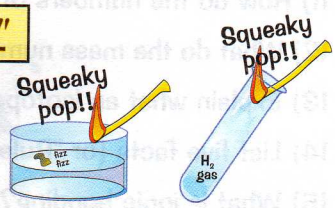
b) by turning white anhydrous copper sulphate to blue hydrated copper sulphate (and getting hot)

c) by turning anhydrous cobalt chloride paper from blue to pink.



5) Lab test for Hydrogen — the notorious "Squeaky pop"

Just bring a lighted splint near the gas with air around. If it's hydrogen it'll make a "squeaky pop" as it burns with the oxygen in the air to form H_2O.



6) Lab test for Alkenes — they decolourise Bromine

(i.e. they turn it clear).

Hazard Symbols

The official hazard symbol for "harmful" and "irritant" is a black cross. Some products add an "h" or "i" to show the difference.

Oxidising

Provides oxygen which allows other materials to burn more fiercely.

EXAMPLE: Liquid oxygen.

Harmful

Similar to toxic but not quite as dangerous.

EXAMPLE: Petrol, meths.

Highly Flammable

Catches fire easily.

EXAMPLE: Petrol.

Irritant

Not corrosive but can cause reddening or blistering of the skin.

EXAMPLES: Bleach, children, etc.

Toxic

Can cause death either by swallowing, breathing in, or absorption through the skin. EXAMPLE: Cyanide.

Corrosive

Attacks and destroys living tissues, including eyes and skin.

EXAMPLE: Sulphuric acid.

Learn the Six Lab Tests — easy as squeaky pop...

This is pretty basic stuff, but people still lose marks in the Exam because they don't make sure to learn all the little details really thoroughly. That's true for just about everything in this book. It's no good just letting your eyes drift lazily across the page and thinking "Oh yeah, I know all that stuff". You've gotta really make sure you do know it all. And there's only one way to do that — so do it now.