

# Flame Emission Spectroscopy

## Instrumental Methods of Analysis

- New technology, developed over the last few decades, have considerably advanced analytical chemistry. These new instrumental methods have three main advantages, they are:
  - More rapid (produce results faster)
  - More **accurate** (they are more reliable at identifying elements/compounds)
  - More sensitive (they can detect very small amounts of substances)
- Each method works in a different way, but they essentially have most features in common:
  1. A stimulus enters the sample (light, heat, current, voltage etc)
  2. This is then read by a detector, producing a signal
  3. The signal is amplified/digitalised
  4. The output is plotted (usually) on a graph

## Flame emission spectroscopy

- It is a technique for identifying metals in a metal compound.
- **Flame emission spectroscopy** is an advanced version of the Flame Tests and uses a Spectroscope to separate the colours into a spectrum.
- When white light passes through a Spectroscope the colours are split into a spectrum (the rainbow).
- When metal compounds burn they only produce certain colours so when this light is passed through a spectroscope in **flame emission spectroscopy** it produces very specific lines called a 'Line Spectrum'.
- Flame photometers (often referred to as a flame emission spectroscope) is an instrumental method used to analyse metal ions.
  1. a sample is heated in a flame, and the light emitted from the flame is passed through a **spectroscope**
  2. the resulting pattern is known as a **spectrum**
- Every element has its own specific set of wavelengths, so every pattern is unique (can be thought of as an element's 'fingerprint').

## C8: Purity and

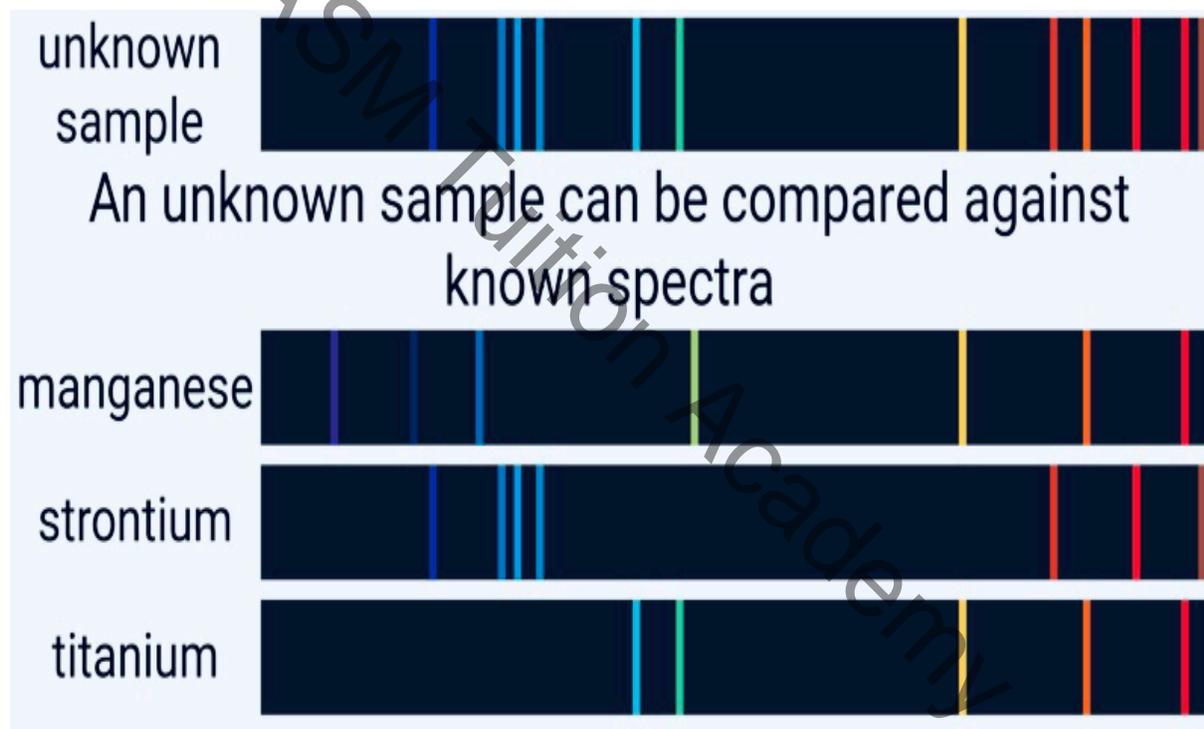
### Formulations

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- If there is a mixture of ions, one colour may be covered up by another in a flame test. In an emission spectrum, the intensity of the light is actually a measure of concentration of the different elements. This means that the ratio of ions present can be determined.

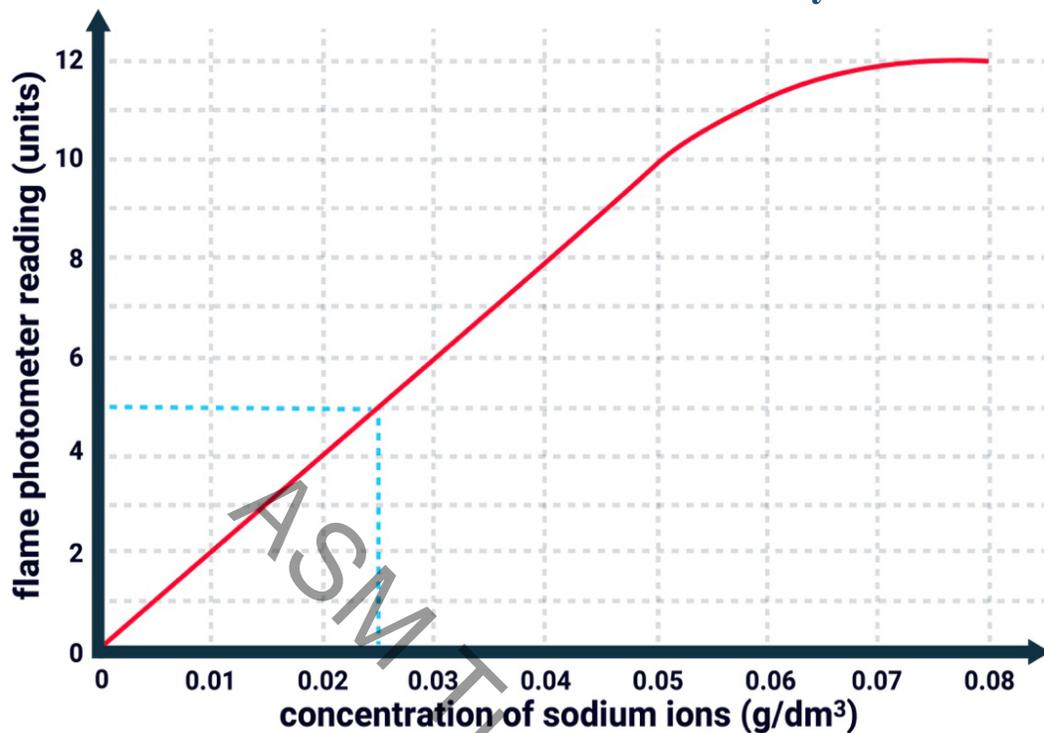
### Determining concentrations

- A reading can be taken from the flame photometer for different concentrations of a metal ion in solution. These readings are then used to plot a **calibration curve**.
- Having a calibration curve of known samples, allows scientists to be able to identify the concentration of a sample just by looking at the graph!
- For example, if a solution of sodium ions gave a reading of 5 units on the flame photometer, then the calibration curve allows us to read off that the sample had a concentration of 0.025 g/dm<sup>3</sup>.

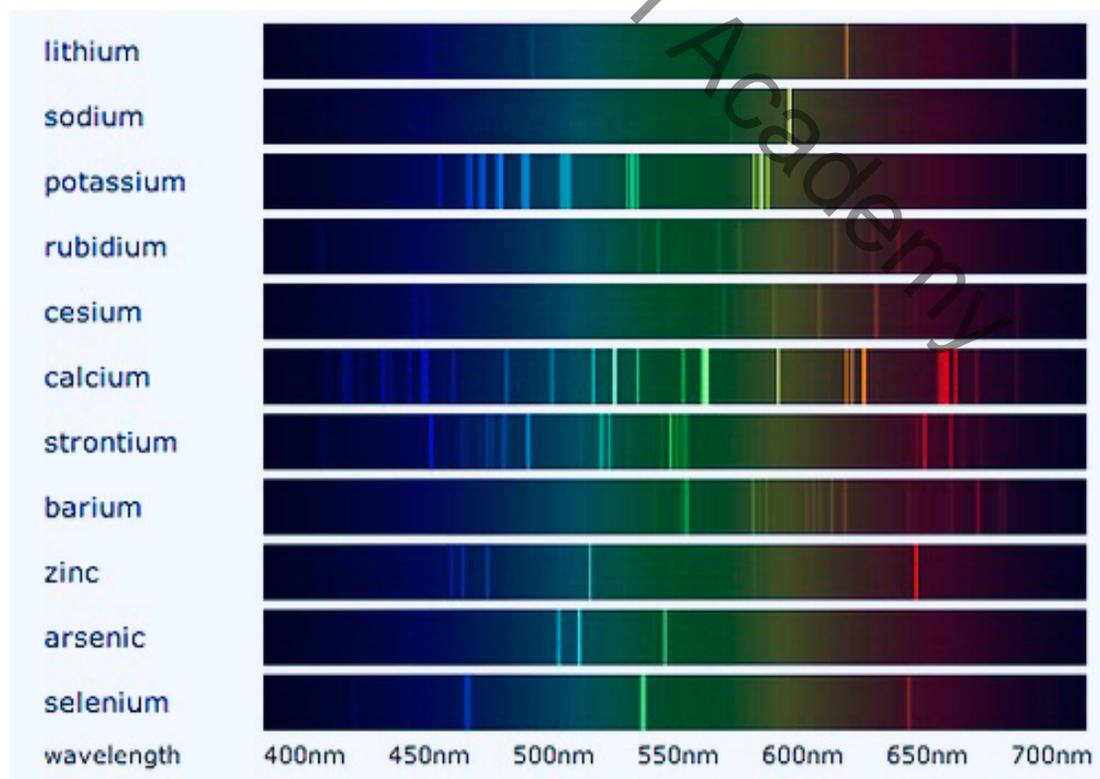


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## Spectrum of different metals



## **C8: Purity and**

### **Formulations**

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### **Applications of flame photometry:**

1. It is used to determine even the small quantities of metals like lead, calcium, mercury etc.
2. So, it is used in the determination of sodium, potassium, calcium, lithium etc. in the biological samples (like serum, interstitial fluids etc.).
3. It is used in the determination of lead in the petrol.
4. It is used in determination of calcium and magnesium in the cement

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