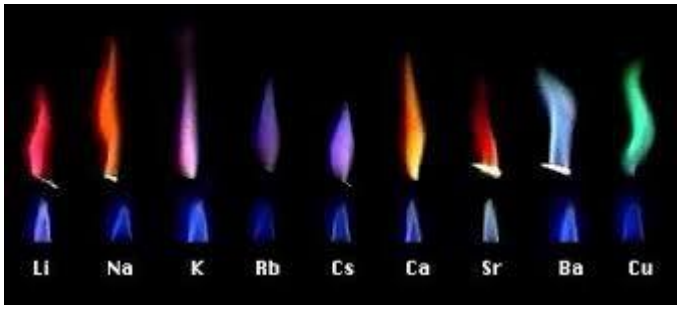
FLAME TESTS



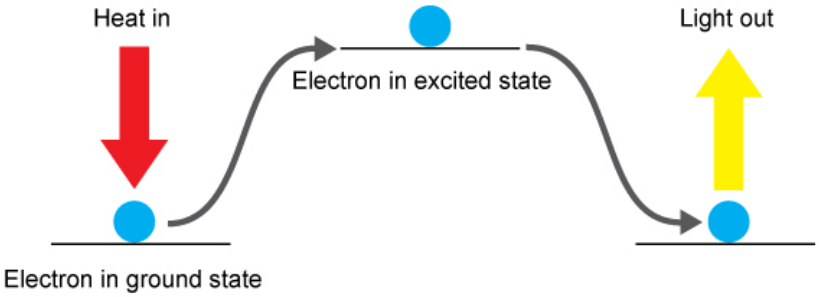
The presence of certain metal ions in compounds causes characteristic colours to be imparted to a non-luminous Bunsen flame when such substances are brought into contact with the flame.

Examples include:

Na compounds: yellow	Li compounds: red	K compounds: lilac
Rb compounds: red	Ca compounds: brick red	Ba compounds: apple green

Flame testing allows a quick, if rough, means of indicating the presence of such metal ions in the compounds, but it is far from fool proof – the various reds are not easy to tell apart, while the presence of trace quantities of Na^+ in a sample may result in serious masking of the flame colour by the intense yellow of the sodium flame. Flame test are an example of qualitative analysis.

The characteristic colour imparted to the flame is due to the fact that the flame energy is able to produce isolated gas phase metal atoms, e.g. $NaCl_{(s)} \rightarrow Na_{(g)} + Cl_{(g)}$ (flame centred on arrow). A small percentage of the metal atoms absorb energy to produce excited state atoms, and these excited atoms then release photons of radiation unique to that particular element, giving the flame of characteristic appearance provided the emitted photons have wavelengths lying in the visible range of the spectrum.



Since metal chlorides are more volatile than most other metal compounds (oxides are especially involatile) the test is conducted in the following way: a clean platinum wire is dipped into concentrated hydrochloric acid (to remove impurities) and then into a finely powdered or microcrystalline sample of the substance under test. The loaded wire is then brought into contact with the edge of a non-luminous Bunsen flame and the colour produced noted. Alternatively, a solution of the salt can be sprayed into the flame and at the temperature of the flame the solvent (often water) evaporates leaving fine crystals to produce the same results (e.g. $NaCl_{(aq)} \rightarrow NaCl_{(s)} \rightarrow Na_{(g)} + Cl_{(g)}$ (flame centred on arrow)).