

# PRACTICAL: FLAME TESTS

## INTRODUCTION

Some metallic elements and metallic salts (ionic compounds) will emit light of a particular colour or wavelength when exposed to a Bunsen burner flame. This results in the flame having a characteristic colour that can be used to identify the metallic element present. That is, different elements will produce different colours in a flame.

### AIM:

To qualitatively analyse pure samples of metallic salts using flame tests.

### MATERIALS:

Small samples of the following metallic salts:

Sodium chloride (NaCl)  
Potassium chloride (KCl)  
Barium chloride (BaCl<sub>2</sub>)  
Copper chloride (CuCl<sub>2</sub>)  
Strontium chloride (SrCl<sub>2</sub>)

Nichrome wire  
Concentrated HCl  
Bunsen burner  
Safety mat  
Safety glasses

### METHOD:

#### STEP 1:

##### Clean a platinum or nichrome wire

This is done in 2 stages:

- A platinum or nichrome wire is dipped in concentrated HCl. The acid will dissolve any impurities present on the wire. Platinum and nichrome are used because they are inert (unreactive) metals that will not produce colours in a Bunsen burner flame.
- The wire is then heated using a blue Bunsen burner flame. The heat will vapourise (turn into a gas) any impurities on the wire. The wire should now be clean and ready to be used for analysis.

#### STEP 2:

##### Moisten the wire in concentrated HCl and place it in the sample to be analysed:

- The wire is dipped in concentrated HCl for a second time. The moistened wire will now be dipped into the metallic salt that is to be analysed. The metallic salt will dissolve in the acid, causing the separation of the ions present.

### STEP 3:

**Place the wire in a blue Bunsen burner flame:** The ions in the salt will be vapourised by the flame. The flame will change colour. The sample can be identified by comparing the colour of the flame with those colours emitted by known samples.

Repeat steps 1, 2 and 3 for the remaining 4 metallic salts.

### RESULTS:

Metallic salt	Flame Colour observed
Sodium chloride	Yellow
Potassium chloride	Lilac
Barium chloride	Yellow-green
Copper chloride	Green
Strontium chloride	Scarlet

### DISCUSSION QUESTIONS:

#### QUESTION 1

What are the limitations of flame tests?

#### *Solution*

Many samples will produce similar colours when exposed to a Bunsen burner flame, Eg. potassium chloride and strontium chloride. Flame tests will mainly excite the electrons of group 1 and 2 elements only.

#### QUESTION 2

All of the samples tested contained the chloride ion. How do we know that the flame colours produced by the samples were not caused by this ion?

#### *Solution*

If the chloride ion was responsible for the flame colour, every sample would produce the same flame colour as all the samples contained this ion.

#### QUESTION 3

Why is the wire made from nichrome and not copper?

#### *Solution*

Nichrome is not excited by a Bunsen burner flame. Copper is excited by a Bunsen burner flame and emits green light when the electrons go back to the ground state. This emitted light would interfere with the light emitted by the sample being tested

### CONCLUSION:

Flame colours of each of the samples were observed, allowing their identification.