

When certain pure compounds are heating in the hottest part of a flame, they are vaporized and emit a distinctive color to the flame. The color of the flames helps to identify the nature of the compound. When the flame test is applied to a mixture of compounds, light of several different wavelengths may be emitted. In this event, one color may interfere with or mask a second color. Thus, flame tests using only the eye are limited. The usefulness of flame tests is extended by using a spectroscope, an instrument capable of separating light into its component wavelengths.

In this experiment, you will apply flame tests to several pure compounds. And then use the results of your tests to identify an unknown. In this experiment, not only will you see a change in the flame color, but you will see distinct lines of color spectra through the spectroscope (which is further used for identification. **Objectives:**

- To observe and record the colors imparted to a flame by the presence of selected ions.
- To use the spectral lines and flame test technique to identify an unknown crystalline substance.
- To observe the wavelength of light associated with the presence of selected ions.

Procedure:

Obtain a wet toothpick. Dip it in a metal salt and place it on the hot flame of the Bunsen burner. Observe the color of each metal ion (solid salts); using a spectroscope aimed at the flame, record the bright spectrum colors you can detect. You must use a new, wet toothpick each time. Try not to burn the toothpick smoke will interfere with the flame color. Record your observations in the data table.

Perform the same experiment to a crystalline "unknown" and use this test (and other observations) to identify the metallic ion in the crystal (salt). Record your observations in the data table. Observe different flames/lights through the spectroscope. Try to distinguish between different elements by their spectra.

Name of Salt (& Formula)	Physical Observations	Major Spectral Lines (Color)	Color of
	(Color, texture, etc.)	Red-Orange-Yellow-Green-Blue-Violet	Flame
Lithium Chloride			
(LiCl)			
Calcium Chloride			
CaCl ₂			
Potassium Chloride			
(KCI)			
Copper(II) Chloride			
CuCl₂			
Strontium Chloride			
SrCl ₂			
Sodium Chloride			
NaCl			
Barium Chloride			
BaCl ₂			
???Unknown ???			
Name			

Data Table

<u>Summary</u>

- 1. What is your evidence that the color of the flame is caused by the metallic (positive) ions rather than negative chlorine ions? Explain!! (Hint: Think about the differences between + and ions):
- 2. Where have you seen colored flames before? Give a few examples.
- 3. Explain ground state and excited state and explain why you can see colors.
- 4. Which method, flame test or spectroscope, do you think is better for identification of elements? Explain.
- 5. What was your unknown? Explain why you think it is correct?

Write a conclusion that includes a brief summary of what you did, what you found, how you did it, and errors. One paragraph please!