



## Flame Test Lab



Name

Period

Seat #

### Purpose:

When certain compounds are heated in a flame, they emit a distinctive color. The color of the emitted light can be used to identify the compound.

### Background:

The *atomic emission spectrum* of an element is the set of frequencies of the electromagnetic waves emitted by atoms of the element. Each element's atomic emission spectrum is unique and can be used to determine if that element is part of an unknown compound.

### Materials:

Bunsen Burner Spray Bottles Distilled water

Solution of: LiCl, NaCl, KCl, CaCl<sub>2</sub>, Sr(NO<sub>3</sub>)<sub>2</sub>, CuCl<sub>2</sub>, CuSO<sub>4</sub>, Copper Wire, Na<sub>2</sub>SO<sub>4</sub>, K<sub>2</sub>SO<sub>4</sub>, unknown

### Procedure:

- Using one spray bottle at a time, spray the solution at a 45 degree angle upward into the flame. For copper wire, place tip of wire directly in the flame. Observe the color of the flame and record it in your data table.
- Repeat step 1 for each of the solutions to be tested. Be sure to record the color of each flame in your data table.
- Obtain a sample of unknown solution from your teacher. Repeat the procedure in step 1 using the unknown solution. Record the color of the flame produced by the unknown solution in your data table. Do not throw anything away.

### Data Table:

Fill in the empty boxes and give your table a descriptive name. Fill out the last column before lab begins, as part of your pre-lab questions.

Compound	Formula	Metal	Flame Color	e <sup>-</sup> configuration	
Calcium Chloride	CaCl <sub>2</sub>			Ca	
Copper Chloride	CuCl <sub>2</sub>			Cu	
Barium Chloride	BaCl <sub>2</sub>			Ba	
Potassium Chloride	KCl			K	
Sodium Chloride	NaCl			Na	
Lithium Chloride	LiCl			Li	
Copper Sulfate	CuSO <sub>4</sub>			Cl	
Potassium Sulfate	K <sub>2</sub> SO <sub>4</sub>			Will it gain or lose e <sup>-</sup> ? How many?	
Sodium Sulfate	Na <sub>2</sub> SO <sub>4</sub>			Ca	
Calcium Sulfate	CaSO <sub>4</sub>			K	
Copper Wire	Cu			Li	
Strontium Nitrate	Sr(NO <sub>3</sub> ) <sub>2</sub>			Cl	

**Pre-Lab Questions:** Answer these on this handout BEFORE doing the lab.

1. Write out the electron configuration for Lithium and Chlorine. Based on their electron configurations, why do you think those two elements would bond together to make the compound lithium chloride?

2. Sketch a diagram that shows the difference between atomic emission and absorption. Which is responsible for the light we will see during lab?

Absorption	Emission

**Question Set:** Retype and answer in complete sentences on a separate sheet of paper – INDIVIDUALLY!!!! This is NOT a group lab write up! Do this by yourself. One per person!

1. Each of the known compounds tested contains chloride, yet each compound produced a flame of a different color. Explain why this occurred and support your answer with examples.
2. Each of the known compounds tested contains Sulfate, yet each compound produced a Flame of different color. Explain why this occurred and support your answer with examples.
3. How does the atomic emission spectrum of an element relate to these flame tests? Explain what happens to an electron when it gains energy, and then what happens when it loses that energy.
4. What is the identity of the unknown metal solution? Describe how you know.
5. Draw a diagram that illustrates what is happening when you add energy to electrons and a color is given off as energy is lost. Also describe your diagram by explaining what you are showing.
6. What patterns do you notice in the groupings of elements within the periodic table?  
(Orbitals)
7. Predict what color Barium Sulfate ( $\text{BaSO}_4$ ) will burn. Explain your reasoning.
8. Explain the difference between emission and absorption spectra. (Look them up)

**When you turn in your lab you will turn in this handout as well as your typed answers to the Question Set.**