

**General Chemistry**  
**Mr. MacGillivray**  
**Lab: Flame Tests**

## Introduction

In this lab you will investigate a method for identifying metallic ions, flame spectroscopy. **Spectroscopy** is the analysis of the light that is emitted by substances that have been energized (that is, **excited**) by heat or some other means. The light that is emitted is called the **emission spectrum**.

We will place solutions of several metal ions in the hottest part of the Bunsen burner flame to see their individual emission spectra. Because each element on the periodic table has a different number (and arrangement) of electrons, each element has its own unique emission spectrum. This is an important property of elements; it allows scientists to determine the composition of many substances from a great distance. In order to see the individual colors of each spectrum, we would need to view the light through a prism. However, in today's lab you will be able to distinguish the different metals from one another with the naked eye alone.

It should be noted that ALL substances emit light when excited. However, today's flame tests will only reveal the light emitted by the metal ions in each compound because the light given off by the other components of the compound are invisible to the naked eye.

## Materials

Solutions of several metal ions  
Wooden splints

Bunsen burner

## Procedure

1. Obtain a splint that has been soaked in one of the compounds.
2. Place the splint in the hottest part of the Bunsen burner flame briefly. Avoid burning the splint if possible, because the color of the burning wood will mask the color of the excited metal ions.
3. Place the wooden splint on the lab bench until it has cooled. If one of your splints falls into the sink, remove it once it has cooled and place it in the trash.
4. Repeat procedures 1-3 for all of the KNOWN solutions. Then test the UNKNOWN solutions. Use your observations of the known solutions to identify the unknown solutions.

## Observations

Record your observations in the provided table.

### Observations Table

	Ion Tested	Observations
<b>*FILL IN THE IDENTITY OF THE UNKNOWN SOLUTIONS IN THE BOXES BELOW</b> ↓ <b>Identity of Unknowns:</b>	<b>Li<sup>+</sup></b>	
	<b>Na<sup>+</sup></b>	
	<b>K<sup>+</sup></b>	
	<b>Ca<sup>2+</sup></b>	
	<b>Ba<sup>2+</sup></b>	
	<b>Sr<sup>2+</sup></b>	
	<b>Cu<sup>2+</sup></b>	
	<b>UNK #1</b>	
	<b>UNK #2</b>	

#### Questions

1. Sketch an atom in the relaxed (ground) state, in the excited state, and then after it has returned to the relaxed state.
  
2. How are scientists able to determine the composition (that is, how are they able to figure out what they are made of) of the sun and of distant planets without actually going there?
  
3. List three types of light that are invisible to humans. There are many examples in your textbook on p.297.