

### Activity #3: Flame Tests and Emission Spectroscopy

#### Materials:

Bunsen Burner	Spectrum Tube Power Supply	Calcium Chloride (CaCl <sub>2</sub> ) 0.5 M
Wooden Splints	Gas Discharge Tubes (H <sub>2</sub> , He, Ne, Ar)	Strontium Chloride (SrCl <sub>2</sub> ) 0.5 M
Handheld Spectroscopes	Lithium Chloride (LiCl) 0.5 M	Barium Nitrate (BaCl <sub>2</sub> ) 0.5 M
Colour Pencils	Sodium Chloride (NaCl) 0.5 M	Copper (II) Chloride (CuCl <sub>2</sub> ) 0.5 M
Cobalt Glass Plate	Potassium Chloride (KCl) 0.5 M	

#### Procedure:

##### A. Flame Tests:

1. Light the Bunsen Burner
2. Pick one of the prepared wooden splints that are soaked in the solution and place it in the flame. Observe the colour change and record your result. All wooden splints are labeled with the metal part of the compound tested.  
(\*Note: For the potassium chloride splint, use a cobalt glass plate to make the observation.)
3. Extinguish and discard the splints according to the instructions given in class.

##### B. Emission Spectroscopy:

1. Make sure the spectrum tube power supply switch is at the OFF position and unplugged.
2. Place one of the gas discharge tube into the power supply. Plug in socket and turn switch ON.
3. In a dark part of the room, observe the light emitted from the gas discharge tube using the handheld spectroscopes. Record the colour and the positions (wavelengths between 350 to 750 nm) of the lines. (*You should use color pencils for the observations when you hand in your statements of understanding.*)
4. Repeat steps 2 and 3 using other gas discharge tubes. (Use gloves to handle hot discharged tubes.)

#### Observations:

##### Part A: Flame Tests

IA	IIA	IB
Li:		
Na:		
K:	Ca:	Cu:
	Sr:	
	Ba:	

**Part B: Emission Spectroscopy**

Sketches of Line Spectrum								
Elements	750 nm	700 nm	650 nm	600 nm	550 nm	500 nm	450 nm	400 nm
H <sub>2</sub> Hydrogen								
He Helium								
Ne Neon								
Ar Argon								

**Questions to Ponder Before Writing the Statement of Understanding:**

- Using scientific principles you have learned so far, explain why when materials are heated, their elements emit specific colours of light.
- The energy of coloured light increased in the order of red, yellow, green, blue, indigo, and violet. Looking at the two columns (IA and IIA – which also correspond to the first two columns of the Periodic Table of Elements) of the observation table in Part A, list the metallic element in increasing order of the energy of light emitted of each column. Do you see a pattern? Why?
- In Part A, the metal component of each compound (Li, Na, K, Ca, Sr, Ba and Cu) is responsible for the change in flame colours. Write the electron configurations and draw the quantum orbital diagrams of these elements (full or abbreviated). You may need to use it in the statement of understanding.
- Explain why in Part A of the experiment, we see one colour, and in Part B, we see a series of different coloured lines.
- Does the pattern(s) you observed in Part A extend to the spectral lines you observed in Part B? What does that tell you? Why?

**Statements of Understanding:**

When writing the paragraphs, make sure you address the following:

- What are the phenomena you are investigating? (There are many, you should choose two.)
- How can you explain the phenomenon using the evidences you collected (please list those evidences)? (**Particle Reasoning** please!)
- What claims are you making from your explanations?

**Hand in the observations along with your statements of understanding! A Title is also highly appropriate.**