

Name: _____

Period: _____

Seat#: _____

Required Sections: (Refer to R-5 for guidelines and requirements. Make note of any specific changes given by your teacher in class)

Prelab: All written in your lab notebook - Materials, Reagent Table, Procedures, Data Table (should be pre-written in your lab notebook but do not rip out carbon copy pages of data table when turning in prelab)

Post-lab: - All written in your lab notebook on a new page – Discussion Questions

Background

Have you ever seen a fireworks display? Where do all of the colors come from?

In this activity, you will investigate the colors of flame produced by solutions of metal salts.

A flame test is a procedure used to test qualitatively for the presence of certain metals in chemical compounds. When the compound to be studied is excited by heating it in a flame, the metal ions will begin to emit light. Based on the emission spectrum of the element, the compound will turn the flame a characteristic color. This technique of using certain chemical compounds to color flames is widely used in pyrotechnics to produce the range of colors seen in a firework display.

Certain metal ions will turn the flame very distinctive colors; these colors in turn can help identify the presence of a particular metal in a compound. However, some colors are produced by several different metals, making it hard to determine the exact ion or concentration of the ion in the compound. Some colors are very weak and are easily overpowered by stronger colors.

In this activity, solutions of ionic salts are sprayed into a Bunsen burner apparatus. You will be able to see the different colored flames produced. By comparing the color given off by an unknown with the known metal salts, the identity of the metal salt can be determined.

Materials

Bunsen Burner, matches or striker, various metal containing compounds (0.1 M concentration)

- Calcium Chloride
- Copper Chloride
- Barium Chloride
- Potassium Chloride
- Sodium Chloride
- Lithium Chloride
- Copper Sulfate
- Potassium Sulfate
- Sodium Sulfate
- Calcium Sulfate
- Strontium Nitrate

Procedure:

- 1) Light the Bunsen burner and open the air vent to obtain a non-luminous flame with two blue cones.
 - Be sure to avoid a yellow flame.
- 2) Spray the first sample into the bottom of the apparatus.
 - You can spray a few times until you get an intense color, but please do not be wasteful!
 - Spray at a 45-degree angle upwards. Do NOT spray towards anyone!
- 3) Record the color and intensity (bright/faint) of the flame in the data table.
- 4) Repeat steps 2 & 3 with the other salt solutions. Be sure to record the colors as precisely as possible.

Data Table - sample table. Yours needs a descriptive title, include all necessary rows for data collection, and to be drawn big enough and neat enough to write in!

Chemical Formula of Metal Salt	Metal Atom Found in the Salt Compound	Flame Color and Intensity
Sample Table		

Discussion questions on back!

Dougherty Valley HS Chemistry

Flame Tests – Atomic Emission

Discussion Questions: - *To be done AFTER the lab is done. Remember – do not copy the questions, but make sure to paraphrase them well enough that it will remind me what the question was about!*

- 1) What subatomic particles are found in the chemicals that were responsible for the production of colored light?
- 2) What does it mean when the electrons are “excited”?
- 3) How were the electrons “excited” in this part of the experiment – how did we physically do it?
- 4) Why do different chemicals emit different colors of light?
- 5) What is the relationship between energy, frequency, and wavelength? (Look it up! Research your answer!)
- 6) List the colors observed in this lab in order from the highest energy to the lowest energy. (You don’t need to know the actual wavelengths to do this, we are just ranking them from high to low).
- 7) List the colors observed in this lab in order from the highest frequency to the lowest frequency. (You don’t need to know the actual wavelengths to do this, we are just ranking them from high to low).
- 8) List the colors observed in this lab in order from the highest wavelength to the shortest wavelength. (You don’t need to know the actual wavelengths to do this, we are just ranking them from high to low).
- 9) Based on the results of your experiment, what metal was found in the unknown(s)? Explain how you know this.
- 10) Explain why we did not see distinct lines (like on an emission spectrum) when the metal salts were burned. In other words, what didn’t we do that would have taken the colored light we saw and turned it into a line spectra.
- 11) Do you think we can use the flame test to determine the identity of unknowns in a mixture? Why or why not?
- 12) Colorful light emissions are applicable to everyday life. Where else have you observed colorful light emissions?