

## Flame Test Lab

Directions for writeup BEFORE lab day.

Write: Title, Theory, Purpose, Prelab (write question & answer)

Glue in: Materials, Procedure, Data

### Theory: Spectroscopy (define it)

Purpose: To discover that atoms of different elements can be identified by the color of a hot flame.

### Materials:

Wood Splints, Burner, nichrome wire & cork, Safety Goggles, gloves, & aprons, crucible Tongs hydrochloric acid (HCl), Lithium nitrate  $\text{LiNO}_3$ , barium nitrate  $\text{Ba}(\text{NO}_3)_2$ , sodium chloride NaCl, strontium nitrate  $\text{Sr}(\text{NO}_3)_2$ , potassium nitrate  $\text{KNO}_3$ , calcium nitrate  $\text{Ca}(\text{NO}_3)_2$ , copper (II) nitrate  $\text{Cu}(\text{NO}_3)_2$  or copper (II) sulfate  $\text{CuSO}_4$

### Prelab: Flame Test

1. What is an ion? What is a cation?
2. Name 2 hazards to be aware of while working with HCl
3. List all the cations you will be testing.
4. What is the formula for:
  - A. barium nitrate,
  - B. strontium nitrate
  - C. sodium chloride
  - D. copper (II) nitrate
  - E) lithium nitrate
  - F) potassium nitrate
5. How do you clean all glassware?
6. What 2 metals are melted together to make the alloy, nichrome?
7. Why are you using hydrochloric acid in the lab?

### Procedure:

#### **Part A: Wooden Splint Method**

1. Take the dropper that is in the dropper bottle out and place on a towel. Soak a wooden splint for three minutes in solutions of lithium nitrate, copper (II) nitrate, & sodium chloride. Use a different splint for each solution.
2. Remove a piece of soaked wooden splint from the solution with crucible tongs.
3. Hold the soaked splint in the flame of a burner. Record the color. If color is not conclusive, you may use a small amount (size of a nerd candy) and place on the edge of your splint. Don't burn the splint.

#### **Part B: Nichrome wire-cork method**

1. Test all the other solutions on your materials list using this method. Obtain a nichrome wire and cork and clean the wire by dipping it in HCl and the putting the wire in the Bunsen burner flame.
2. \*\*You will observe a color (other than blue) if the wire is "dirty". When the flame turns bright orange and you see the end of the wire as orange, then you are burning the wire. No ions are present. You know that your wire is clean, when you don't see any color in the flame after burning the wire. No ions are present. You know that your wire is clean, when you don't see any color in the flame after burning the wire for about 10-20 seconds.
3. Repeat step 1 if your wire continues to exhibit colors in the flame.

#### **Part C: Unknown Testing**

You have 1 of your known salt solutions. Which is it? Use both methods and decide what cation is present in your unknown. Don't forget to write the unknown number in your data table.

Cleanup: Place our used splints in the trash. Do not leave them in the sink!

Data Table:

| Metal Ion       | Color of solution | Flame Color          |
|-----------------|-------------------|----------------------|
| Lithium         |                   |                      |
| Barium          |                   |                      |
| Sodium          |                   |                      |
| Strontium       |                   |                      |
| Potassium       |                   |                      |
| Calcium         |                   |                      |
| Copper          |                   |                      |
| Unknown # _____ |                   | -----<br>The ion is: |

**POSTLAB**

Discussion:

1. What color of light is associated with the most energy?
2. Describe what happens to the electrons when the element is heated to high temperatures?
3. What is meant by an "excited" electron?
4. If you have some road salt, how can you tell it is calcium chloride or sodium chloride?
5. If you could design a fireworks display, what salts would you use and why?
6. How is this lab related to our knowledge of space and stars?
7. What ion are you identifying with the flame test?
8. Why can we see the sun changing from yellow to orange to red as time in the evening passes? (hint: light waves).

Conclusion: Write a conclusion addressing your objective as it relates to why different metal ions produce different color flames. After consulting with your classmates and the Internet, did you observe correctly? Was there any discrepancies? Why? Compare and contrast your results.

Resources:

**SUBMIT FINAL LAB ON TURNITIN.COM:**

**Make a WORD document with pictures of your prelab and data. Then, continue to type discussion (answer in complete sentences), conclusion, and resources.**