Ion Flame Test Lab

**Background:**

The normal electron configuration of atoms or ions of an element is known as the “ground state.” In this most stable energy state, all electrons are in the lowest energy levels available. When atoms or ions in the “ground state” are heated to high temperatures, some electrons may absorb enough energy to allow them to “jump” to higher energy levels. The element is then said to be in the “excited state.” This excited configuration is unstable, and the electrons “fall” back to their normal positions of lower energy (ground state). As the electrons return to their normal levels, the energy that was absorbed is emitted in the form of electromagnetic energy. Some of this energy may be in the form of visible light. The color of this light can be used as a means of identifying the elements involved. Such analysis is known as a flame test.

To do a flame test on a metallic element, the metal is first dissolved in a solution and the solution is then held in the hot, blue flame of a Bunsen burner. This test works well for metal ions, and was perfected by Robert Bunsen (1811 – 1899). Many metallic ions exhibit characteristic colors when vaporized in the burner flame.

**Purpose**: To identify metals by the color of their flame.

**Procedure:**

Cleaning the wire loop

1. Obtain a wire loop and a small amount of hydrochloric acid
2. Turn on a Bunsen burner
3. Dip the wire loop into the hydrochloric acid and hold the wire in the flame.
4. Hold the wire loop in the flame for 5 to 10 seconds.

Testing the Known Metals

1. Dip the wire loop into the known metal solution.
2. Hold the loop with the in the flame for a few seconds.
3. Record the color of the flame.
4. Clean the wire loop as before.
5. Repeat tests 1-4 for the other known metal solutions.

Testing the Unknown Metals

1. Record the unknown number
2. Hold the loop with the in the flame for a few seconds.
3. Record the color of the flame.
4. Clean the wire loop as before.

**Data:**

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| --- | --- | --- | --- |
| **Metal Present in solution**  **(write as an ion)** | **Compound Name** | **Compound Formula** | **Color of Flame** |
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Unknown Number: \_\_\_\_\_\_\_\_\_\_\_ Unknown compound Metal present in solution \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Clean-up**: Put everything neatly in the center basket back in the middle of the table, put the google in the cabinet. Get a clean-up stamp when done here

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**Questions:**

1. State at least three problems that may be involved when using flame tests for identification purposes.
2. Which ions produce similar colors in the flame tests?
3. What did you learn from this experiment?
4. If ions produce specific colors when heated, what application could this type of test be used for? Be specific, and provide at least one real world application.