# Pre-Lab Information

**Purpose** Explore the identity of different metal ions using a flame test.

Time Approximately 45 minutes

**Question** How can you use flame color to identify the metal ion in an unknown compound?

**Hypothesis** If an unknown metal ion’s flame color matches that of a known metal ion, then the metal ion likely is the same because metal ions produce characteristic colors when burned.

**Summary** First you will perform the flame test for six different metal ions and record the color data. Then you will use the color data to identify the metal ions in two unknown solutions.

# Safety

Always wear a lab gown, safety goggles, and gloves while performing an experiment.

Do not smell or taste any of the chemicals.

Use caution around the flame as nearby items can ignite.

Tie back long hair and secure any loose clothing before approaching a flame.

Do not use the Bunsen burner unless you have been trained and approved as a user by your teacher.

To protect yourself from touching both the solutions and the flame, be sure to hold the insulated handle, away from the exposed part of the wire.

Use chemical resistant gloves when handling chemicals and tongs when moving hot objects.

Report all accidents – no matter how big or small – to your teacher.

Keep your work area clear of all materials except those needed for the experiment.

# Procedure

1. **Gather materials.**

|  |  |
| --- | --- |
| * Bunsen burner * striker * nichrome wire with insulated handle * 9 transfer pipets * glass vial * 8 test tubes * test tube rack * grease pencil or labeling tape  and marker | * 15-20 drops of each of the following:   + 1 M hydrochloric acid (HCl) solution   + 0.5 M calcium chloride (CaCl2) solution   + 0.5 M sodium chloride (NaCl) solution   + 0.5 M barium chloride (BaCl2) solution   + 0.5 M lithium chloride (LiCl) solution   + 0.5 M copper(II) chloride (CuCl2) solution   + 0.5 M cesium chloride (CsCl) solution   + Unknown solutions 1 & 2 |

1. **Prepare the vial of HCl and the test tubes.**
   1. Label the vial of HCl. Then label the test tubes CaCl2, NaCl, BaCl2, LiCl, CuCl2, and CsCl.
   2. You also need to obtain and/or label test tubes for the Unknown Solution #1 (labeled U1) and Unknown Solution #2 (labeled U2).
   3. Use a transfer pipet to add approximately 15-20 drops of each solution into the corresponding test tube. Use a clean pipet for each solution to avoid cross-contamination.
2. **Perform the Flame Test for CaCl­2.**
   1. Before testing the metal, you should clean the wire. Dip the tip of the wire in hydrochloric acid. Burn the wire in the hottest part of the flame.

**Note:** The color should begin blue and then fade as the HCl is burned off. Keep the blue color of the HCl solution’s flame and the wire’s own flame color in mind as you proceed.

* 1. Dip the tip of the wire into the test solution (e.g. calcium chloride).
  2. Burn the tip of the wire in the hottest part of the flame and observe the color. If you are unsure of the color, repeat the test.
  3. Be sure to record the color in the data table. You may wish to use a colored marker   
     or pencil.

**Repeat Step 3 for each of Steps 4-10.**

1. **Perform the Flame Test for NaCl**
2. **Perform the Flame Test for BaCl2**
3. **Perform the Flame Test for LiCl2**
4. **Perform the Flame Test for CuCl2**
5. **Perform the Flame Test for CsCl**
6. **Perform the Flame Test for Unknown Solution 1**
7. **Perform the Flame Test for Unknown Solution 2**
8. **Determine the Identities of the Metal Ions of the Unknown Solutions**

Compare the colors of the known solutions to those you tested. Record your answers   
on the data sheet, below the data table.

# Step 12: Dispose of all remaining solutions in bulk containers provided by your teacher. Data

Record your data either in your lab notebook or in the space below.

|  |  |
| --- | --- |
| **Ionic Compound in Solution** | **Observed Flame Color** |
| HCl Solution (baseline) | blue |
| 0.5 M calcium chloride (CaCl2) |  |
| 0.5 M sodium chloride (NaCl) |  |
| 0.5 M barium chloride (BaCl2) |  |
| 0.5 M lithium chloride (LiCl) |  |
| 0.5 M copper(II) chloride (CuCl2) |  |
| 0.5 M cesium chloride (CsCl) |  |
| Unknown Solution #1 |  |
| Unknown Solution #2 |  |

Metal ion in Unknown Solution #1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Metal ion in Unknown Solution #2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_