

Chapter 4 Atomic Structure

Forensics Lab

Using Flame Tests

Forensic scientists use various approaches to distinguish substances. In this lab, you will observe the flame colors of several substances and use the data to determine the identity of an unknown substance.

Problem How can the color of a flame be used to distinguish substances?

Materials

- solutions of calcium chloride, boric acid, potassium chloride, copper(II) sulfate, sodium chloride, and an unknown
- Bunsen burner
- nichrome wire loop
- dilute solution of hydrochloric acid
- wash bottle with distilled water

Skills Observing, Predicting, Using Data Tables

Procedure **Part A: Observing Flame Colors**

1. Light the Bunsen burner. **CAUTION:** *Put on safety goggles and a lab apron. Tie back loose hair and clothing before working with a flame.*
2. Dip the wire loop into the calcium chloride solution and then place the loop in the flame. Observe and record the color of the flame in the data table.

DATA TABLE

Solution	Flame Color
Calcium chloride	
Potassium chloride	
Boric acid	
Copper(II) sulfate	
Sodium chloride	
Unknown	
Identity of unknown	

3. Clean the loop by dipping it into hydrochloric acid. Then, while holding the loop over a sink, rinse away the acid with distilled water. **CAUTION:** *Keep hydrochloric acid away from your skin and clothing. Do not breathe in its vapor.*
4. Repeat Steps 2 and 3 with each of the other solutions. Be careful not to transfer any solution from one container to another. **CAUTION:** *These chemicals are poisonous. Do not let them get on your skin.*

Part B: Examining an Unknown Solution

5. Obtain the unknown solution from your teacher.
6. Repeat Steps 2 and 3, using the unknown solution. Compare your observations with the other data that you recorded to identify the unknown. **CAUTION:** *Wash your hands thoroughly before leaving the laboratory.*

Analyze and Conclude

1. **Comparing and Contrasting** Is there a relationship between the color of the flame and the color of the solution?

2. **Formulating Hypotheses** How do these substances produce light of different colors?

3. **Drawing Conclusions** A forensic scientist does a flame test on a substance that was found at a crime scene. What might the scientist conclude if the flame turns green?
