

Spectroscopy

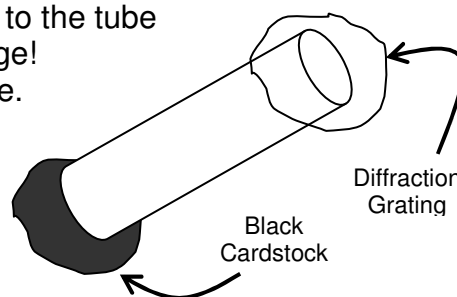
Part I: Build a Spectrometer

Introduction: Atoms of each element absorb and emit light at specific and characteristic wavelengths. A spectrometer spreads out these wavelengths of light into a spectrum of bright colored lines, a different pattern identifying each element. When light from an unknown source is analyzed, the different patterns of bright lines in the spectrum reveal which elements emitted the light. Such a pattern is called an emission spectrum.

Materials

- Cardboard Tube
- Diffraction Paper
- Black Cardstock
- Black Tape
- Colored Pencils
- Gases and Power Sources

1. Place the black semi-circle approximately 1 millimeter apart from one another at one end of the tube. Use black tape to secure the paper to the tube
2. Handle the diffraction paper carefully – do not smudge! Tape the diffraction paper to the other end of the tube.
3. You are now ready to use your spectroscope!
Look through the diffraction paper end of tube.
When viewing, look off to the sides of the tube.

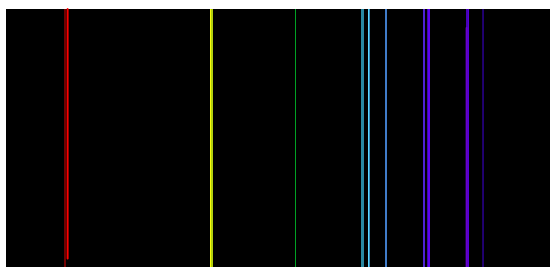


Activity

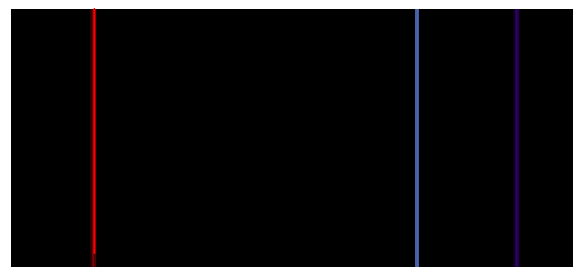
Can you figure out what gas you were looking at? Use the chart below to help you.



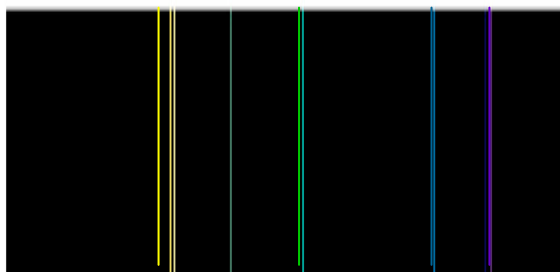
Incandescent Bulb



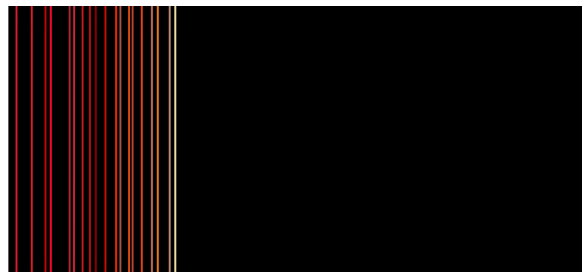
Helium



Hydrogen



Mercury



Neon

Spectroscopy

Part II: Flame Test

Objective

Students will observe and identify elements based on the color produced in a flame test.

Introduction

When certain metals or metal compounds are heated in a flame, they emit a characteristic color. When an atom from a metal element is heated, its electrons become excited and their energy is increased. These excited electrons quickly lose the energy they gain by releasing energy as light. This visible light comes with a specific wavelength that is seen by the human eye as different colors. The characteristic color of the flame can determine the identity of the metal.

Materials

- Candle
- Wire loops (8)
- Goggles
- Matches
- Metallic solutions (6)
- Glass vials with lids (8)

Procedure

1. Place your goggles on your face. Make sure they fit properly.
2. An adult will light a blow torch. A blow torch burns at a temperature of approximately 2400 degrees F (1300 degrees C)
3. A clean wire loop will be dipped into the first test solution. Place the loop over the middle of the flame. Wait patiently.
4. Repeat Step 3. Be sure to look at the base of the flame.
5. Using the colored pencils, color the drawing of the flame the appropriate color according to the type of metal solution. Remember that these drawings represent the **data** you have collected and they should be as accurate as possible. Repeat Step 3 one additional time if necessary.



Sodium Chloride



Cupric Chloride



Strontium Nitrate



Calcium Chloride



Lithium Chloride



Potassium Chloride

Procedure for Unknowns:

1. Ask an adult for a solution that is labeled "Unknown". Record the number.
2. Using the steps listed above, use the colored pencils to color the flame as you see it when the metal solution is burned.
3. Based on the data collected, determine the identity of both the unknowns.



_____?

Unknown # _____



_____?

Unknown # _____