CHEM LAB: EMISSION SPECTROSCOPY and FLAME TESTS

WHAT TO TURN IN:
Hypothesis, Data Table 1, Data Table 2, Calculations (N/A), Error Analysis, Conclusion, Questions #1-4

Objectives

To observe the spectra from different sources of light
To compare the spectra from different sources of light
To compare and contrast flame tests of different solutions of common ions

Introduction

All atoms give off *electromagnetic (em) radiation* if their gases are energized by heating or by a high voltage electric discharge. If the light emitted by a gas is passed through a *spectroscope*, a pattern of narrow bands of light is produced. This pattern is a type of discrete spectrum called an *emission spectrum* or *bright line spectrum*. Each bright line represents an energy bundle. Each element will produce its own unique pattern, like a fingerprint. An incandescent light bulb (IL) produces a *continuous spectrum*, and it shows one blended rainbow effect when viewed through a spectroscope.

The unique pattern of light emitted by an energized atom corresponds to a set of energies released as electrons drop from the higher energy levels of the *excited state* to lower energy levels of the *ground state*. Electrons in the excited state are unstable and cannot remain at the higher level. As the electron drops back to the lower, more stable energy level, it emits a *photon*, a bundle of light energy which is related to specific colors. This can also be shown by *flame tests*, in which solutions of ions can be tested for the appearance of colors in the flame of a burner.

Procedure – Part 1, Spectroscopy

1) Using a spectroscope, examine the spectrum emitted by a low-wattage incandescent bulb. Draw the spectrum in the Data Table 1.
2) Using a spectroscope, examine the spectrum emitted by a fluorescent bulb. Draw the spectrum in the Data Table 1.
3) Repeat with the other gases in high-voltage lamps. Do not touch the high-voltage lamps except to turn them on or off.

Procedure – Part 2, Flame Tests

4) Obtain a wooden splint that has been soaking in a solution of a specific ion. Place the wooden splint into the edge of the flame of the burner. Record the color of the flame in Data Table 2.

Questions

1) What is meant by an "energized" or "excited" gas?
2) Compare and contrast the spectrum from the incandescent light bulb with the spectrum from the fluorescent light bulb.
3) Would you expect red light to have a wavelength closer to 4000 or 7000? Why?
4) Would you expect violet light to have a wavelength closer to 4000 or 7000? Why?

DATA TABLE 1 – SPECTROSCOPY

Directions: Color in the bands you see at the appropriate places, using colored pencils or thin markers.

INCANDESCENT BULB (standard light bulb)

4000	5000	6000	7000

FLUORESCENT BULB (ceiling)

4000	5000	6000	7000

HELIUM (He)

4000	5000	6000	7000

NEON (Ne)

4000	5000	6000	7000

MERCURY (Hg)

4000	5000	6000	7000

DATA TABLE 2 – FLAME TESTS

ION NAME	SYMBOL & CHARGE	FLAME COLOR
Barium	Ba^{+2}	
Copper (II)	Cu^{+2}	
Potassium	K^{+}	
Sodium	Na^{+}	
Lithium	Li^{+}	
Strontium	Sr^{+2}	