

CHEM LAB: EMISSION SPECTROSCOPY and FLAME TESTS

WHAT TO TURN IN: Hypothesis, Data Table 1, Data Table 2, Questions

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 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.

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.

Hypothesis: Write an if-then statement based on the information in the introduction.

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 higher-voltage lamps. Do not touch the higher-voltage lamps!

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.

DATA TABLE 1 – SPECTROSCOPY

Directions: Please write in the numbers shown on the spectroscope display. Color in the bands you see using colored pencils or thin markers.

INCANDESCENT BULB (standard light bulb)

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FLUORESCENT BULB (ceiling)

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HELIUM (He)

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NEON (Ne)

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MERCURY (Hg)

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DATA TABLE 2 – FLAME TESTS

ION NAME	SYMBOL AND CHARGE	COLOR OF FLAME
Barium	Ba ²⁺	
Copper (II)	Cu ²⁺	
Potassium	K ⁺	
Sodium	Na ⁺	
Lithium	Li ⁺	
Strontium	Sr ²⁺	