*Harmonious Electrons, Symmetry, and The Existence of God*

**Flame Test Lab**

**Teacher Page**

Materials: wooden splints (6-10 per group, soaked in distilled water for 24 hours; splints can be cut in

half lengthwise to conserve resources)

1 beaker per group filled with distilled water

1 beaker per group filled with tap water

Bunsen burners

Spectrometers (1 per group or 1 for each student)

(Lab can be completed without using spectrometers; students will not have the

advantage of seeing the spectral lines for each salt. However, images of spectra can be

easily obtained on line.)

Approximately 1 gram of chloride salts (possible salts: CaCl2, NaCl, SrCl2, LiCl, CuCl2, KCl)

Teacher prep: soak wooden splints in distilled water for 24 hours before lab. Provide waste beakers full of tap water, into which students will put used splints. Put a small amount (< 1 gram) of metal chloride salts into small containers. Suggested salts to use are CaCl2, NaCl, SrCl2, LiCl, CuCl2, KCl.

Answers to questions to Think about:

1. Some elements display similar colors, but no two flame colors are exactly the same.
2. Only one atom of the element is needed for a successful test; since that amount is invisible, students will normally have many atoms on the splint. As long as one atom is present, at least one electron will become excited and subsequently relax, revealing a visible colored flame.
3. When the metal is exposed to the flame, an electron will absorb a specific amount of energy, determined by the amount of energy needed for that specific electron to jump to a higher energy level. The electron will return to its ground state and release the same amount of energy, according to the law of conservation of energy.
4. Each element displays a different color because it has a unique electron arrangement. Therefore, the amount of energy absorbed when the electrons become excited is different for every element.
5. Potential design flaws could include contamination of samples, inability to distinguish between colors with the naked eye, students who have diminished color vision. (Colors can be distinguished if a spectrometer is used view the flames.)

Expected colors:

Sodium ions: yellow

Potassium ions: violet

Copper (II) ions: teal

Lithium ions: red

Strontium ions: red

Calcium ions: orange

Have students prepare a lab report according to the format that is customary for the class.