

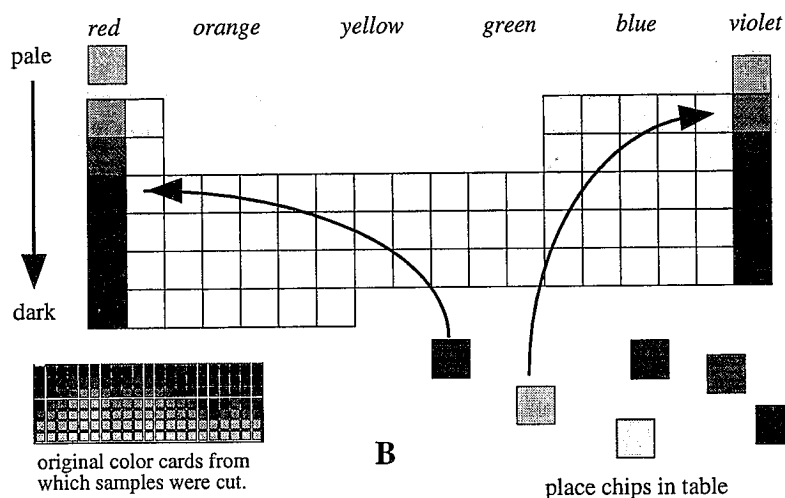
### 2.2.1 FINDING THE "MISSING ELEMENTS"

**Concepts to Investigate:** Periodicity, predicting properties, Periodic Table of the Elements, groups, families, series, periods.

**Materials:** Paint color samples (available at paint stores).

**Principles and Procedures:** Mendeleev's original periodic table arranged elements according to observed properties. You will go through the same process as you attempt to arrange paint color "chips" in a logical fashion. Your instructor will provide you with an envelope containing paint chips in a variety of colors and intensities. The basic color of a paint chip represents its "chemical" properties. For example, all blue paint chips can be considered to have similar properties which are different from those of all red paint chips. The shade of a paint chip represents its "atomic mass." Thus, a light blue paint chip represents an element of low atomic mass while a dark blue paint chip represents an element that has similar properties but more mass. Arrange all chips with similar colors in the same column (family), and all colors with similar intensity (shade) in the same row (series). In the real Periodic Table of the Elements, properties gradually change from metallic to nonmetallic as you proceed through a series from the left to the right across the table. You may illustrate this concept by arranging your columns in a logical manner such as the sequence of colors in the visible spectrum: red-orange-yellow-green-blue-violet. Place the reddest colors on the left of your table, and the most violet colors on the right (Figure B).

After Mendeleev arranged the known elements in a table he noted that there were holes (vacancies) and he predicted that new elements would be found to fill these. Within 15 years of his prediction, all holes were filled with elements that had properties similar to those Mendeleev predicted. Examine your "Periodic Table of Paint Chips." Are any paint chips missing? Describe the properties of those missing paint chips. When you have completed your table, ask your instructor for the envelope containing the missing elements for your set. Were your predictions correct? Can you see how the Periodic Table is useful in predicting properties of unknown elements?



### Questions

- (1) Were you able to form a periodic table with rows (periods) and columns (groups)? Explain how you arranged your table.
- (2) Were you able to predict the properties (color and shade) of the three elements not yet discovered? Where did you place these elements in your table?
- (3) Explain the value of your periodic table in predicting properties of paint chips, and explain how chemists used the Periodic Table to predict the existence of unknown elements.