

ACTIVITY 1- ORGANIZING A STORE

Background Information

In 1828, the Swedish chemist J. J. Berzelius published a list of atomic weights for 54 elements, but at that time there was no apparent order in their properties. By 1830 there were 55 known elements, all with different properties.

Attempts to create some sort of systematic ordering of the elements soon followed. The first major effort in recognizing order was by the German chemist Dobereiner. He noticed that there were similarities among certain elements like chlorine, bromine, and iodine. He found that there were other triads of elements that also possessed the same similarity. The French chemist deChancourtois noticed that there was a pattern in the atomic weights of the elements. Newlands (an English chemist) followed up on the atomic weights and tried to categorize elements into groups of seven and called this the law of octaves. The German chemist Meyer developed his periodic table at the same time as the Russian chemist Mendeleev developed his. Since Mendeleev was able to present his first, he is given credit for the modern periodic table.

Dimitri Ivanovich Mendeleev published his version of the periodic table in 1869. His method for creating the table was very simple. He made cards with the names, atomic masses, and properties for the known elements. He then formed a table by arranging the elements in rows of increasing atomic mass, and columns that reflected uniform trends in their chemical properties.

Although the table appears to be ordered according to increasing atomic mass, it should be noted that there are several cases where he placed a slightly heavier element before a lighter one in order to keep elements with similar properties in the same column. Because tellurium has chemical properties similar to sulfur and selenium, he placed tellurium (127.6 amu) ahead of iodine (126.9 amu). This also allows iodine to fall into the same column as the other halogens.

Because Mendeleev didn't know all of the elements, his periodic table was tentative at first. Keeping elements arranged in the columns according to their properties forced him to leave some gaps. Mendeleev made some bold predictions regarding these gaps, stating that they represented undiscovered elements and, choosing three of those gaps, stated that those elements (he called eka-boron, eka-aluminum, and eka-silicon), once discovered, would have certain properties that he described in detail. By 1885, all three elements were discovered (then named scandium, gallium, and germanium) and Mendeleev's predicted properties of these elements were precisely correct.

Let's take a look at Mendeleev's predicted properties of eka-aluminum (*eka* is a Sanscrit word for "first", meaning that eka-aluminum would be the first element under aluminum in the same group). The element gallium was discovered four years after Mendeleev's prediction and was placed into eka-aluminum's position on the periodic table.

	<u>Eka-aluminum</u>	<u>Gallium</u>
Atomic mass	68 amu	69.9 amu
Density	5.9 g/cm ³	5.94 g/cm ³
Oxide formula	Ea ₂ O ₃	Ga ₂ O ₃

Thus, Mendeleev's periodic table was accepted with great enthusiasm.