Elements

Introduction to the Periodic Table

Each small square of the periodic table shows the symbol for the element and the atomic number.

The vertical columns of the periodic table are called **groups**, *or* **families**. Notice that they are numbered from 1 to 18 from left to right. Each group contains elements with similar chemical properties. *The horizontal rows of elements in the periodic table are called* **periods**. Physical and chemical properties change somewhat regularly across a period. Elements that are close to each other in the same period tend to be more similar than elements that are further apart.

The two sets of elements placed below the periodic table make up what are called the lanthanide series and the actinide series. These metallic elements fit into the table just after elements 57 and 89.. They are placed below the table to keep the table from being too wide.

Types of Elements

The periodic table is broadly divided into two main sections: metals and nonmetals. The metals are at the left and in the center of the table. The nonmetals are toward the right. Some elements show characteristics of both metals and nonmetals.

Metals

There are some properties of metals such as their shininess or metallic luster. Perhaps the most important characteristic property of metals is the ease with which they conduct electricity and transfer energy. Thus, *a* **metal** *is an element that is a good electrical conductor and a good heat conductor*. Most metals also have the property of *malleability*, that is, they can be hammered or rolled into thin sheets. Metals also tend to be *ductile*, which means that they can be drawn into a fine wire. Metals behave this way because they have high *tensile strength*, the ability to resist breaking when pulled. Although all metals conduct electricity well, metals also have very diverse properties. The metals in Group 1 are so soft they can be cut with a knife, yet others are very hard.

Copper: A Typical Metal

Copper has a characteristic reddish color and a metallic luster. It is found naturally in minerals such as chalcopyrite and malachite. Copper conducts electricity with little loss of energy. Copper remains unchanged in pure, dry air at room temperature. When heated, it reacts with oxygen in air. It also reacts with sulfur. Green coating on a piece of weathered copper comes from the reaction of copper and oxygen, carbon dioxide, and sulfur compounds. Copper is an essential mineral in the human diet.

Nonmetals

Many nonmetals are gases at room temperature. These include nitrogen, oxygen, fluorine, and chlorine. One nonmetal, bromine, is a liquid. The solid nonmetals include carbon, phosphorus, selenium, sulfur, and iodine. Low conductivity can be used to define nonmetals. *A* **nonmetal** *is an element that is a poor conductor of heat and electricity.*

Phosphorus: A Typical Nonmetal

Phosphorus is one of five solid nonmetals. Pure phosphorus is known in two common forms. Red phosphorus is a dark red powder and white phosphorus. Because white phosphorus ignites in air at room temperature, it is stored under water. Phosphorus is too reactive to exist in pure form in nature. It is present in huge quantities in phosphate rock, where it is combined with oxygen and calcium. All living things contain phosphorus.