

The Periodic Table

In 1869, a Russian chemist named Dmitri Mendeleev arranged the elements known at that time into a table. He wrote the symbol for each element on a card, along with its physical and chemical properties such as its average atomic mass. Looking at his table, Mendeleev recognized that the chemical properties of the elements repeated at regular intervals. Mendeleev had invented the first periodic table.

Today, a periodic table lists all the known 113 elements. The elements are arranged according to increasing atomic number. A periodic table starts with hydrogen, with atomic number 1, and ends with a newly-created element, whose symbol is Uuq, with atomic number 114. This symbol will eventually be changed when a group of chemists agree upon a name and new symbol for this element. By the way, an element with atomic number 113 has yet to be discovered or created.

A periodic table is arranged in rows and columns. A horizontal row is called a **period**. Elements in the same period have the same number of occupied energy levels. For example, all the elements in Period 3 have electrons that occupy three energy levels, extending to the $3s$, $3p$, and $3d$ orbitals. A vertical column on a periodic table is known as a **group**. The elements in a particular group have the same number of electrons in the outer energy level. These electrons are called **valence electrons**. For example, all elements in Group 1 have one valence electron, although not in the same energy level. Lithium (Li) and potassium (K) are members of Group 1. While lithium has its one valence electron in the second energy level, potassium has its one valence electron in the fourth energy level.

Some groups have names. Group 1 elements are called the alkali metals, Group 2 the alkaline-earth metals, Group 17 the halogens, and Group 18 the noble gases. The noble gases are a unique group because they are unreactive. Unlike the other elements, the noble gases tend not to react because they have a full set of valence electrons.

Most elements are metals. These elements share many properties, especially their ability to conduct electricity. The right side of a periodic table contains

the nonmetals, most of which are gases. Between the metals and nonmetals lie the metalloids, also known as semiconductors. These elements conduct electricity better than nonmetals but not as well as metals. The best known metalloid is silicon (Si), which is used to make computer chips.

In proceeding across a period or down a group, you would also notice certain trends. For example, the **ionization energy** decreases as you move down a group. In contrast, the ionization energy increases as you move across a period. Ionization energy is the energy required to remove an electron from an atom. An atom that has either lost or gained an electron is called an **ion**.

Atomic size also follows a periodic trend. The atomic radius increases as you move down a group. In contrast, the atomic radius decreases as you move across a period. Still another trend can be seen with respect to **electronegativity**, which is a measure of the ability of an atom in a chemical compound to attract electrons.





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Write the letter of the definition or description on the right in front of the appropriate term on the left.

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|----------------------------|--|
| _____ 1. ionization energy | a. horizontal row |
| _____ 2. group | b. metalloid |
| _____ 3. atomic number | c. located on the right side of a periodic table |
| _____ 4. valence electron | d. what is needed to remove an electron from an atom |
| _____ 5. period | e. unreactive |
| _____ 6. nonmetal | f. Group 1 element |
| _____ 7. alkali metal | g. basis for arrangement of a periodic table |
| _____ 8. noble gas | h. located in the outermost energy level |
| _____ 9. electronegativity | i. ability of an atom to attract an electron |
| _____ 10. semiconductor | j. vertical row |