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The Periodic Table of elements

The periodic table, also known as Mendeleev's table, is a table of the chemical elements existing on Earth. The Russian chemist Dmitri Mendeleev is credited with its creation in 1869, although less extensive tables existed before this. He intended to display the patterns apparent in the chemical properties of each element. Since its original creation, new elements have been discovered and added to Mendeleev's initial table.

- The periodic table is a chart containing information about the atoms that make up all matter.
- An element is a substance made up of only one type of atom.
- The atomic number of an atom is equal to the number of protons in its nucleus.
- The number of electrons surrounding the nucleus of an atom is equal to the number of protons in its nucleus.
- Different atoms of the same element can have a different number of neutrons.
- Atoms of the same element with different numbers of neutrons are called “isotopes” of that element.
- The atomic mass of an element is the average mass of the different isotopes of the element.
- The atoms in the periodic table are arranged to show characteristics and relationships between atoms and groups of atoms.

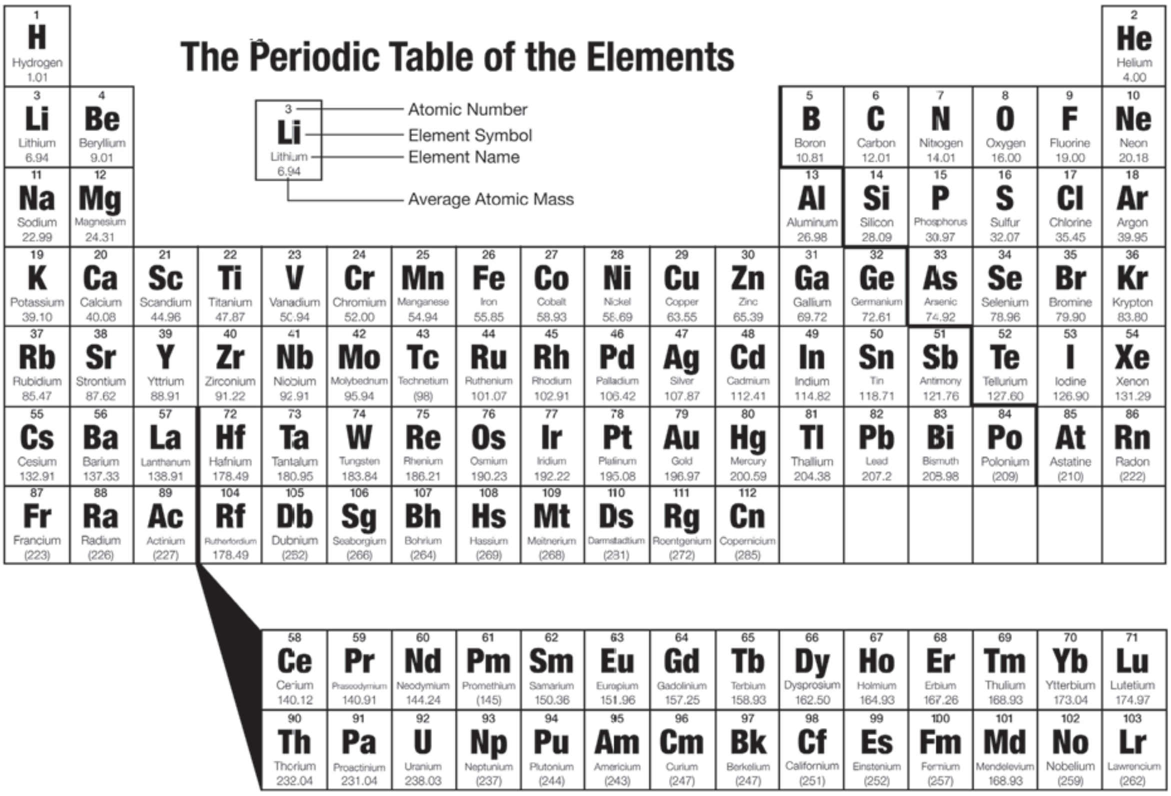
STRUCTURE

The structure of the periodic table is very significant. The current table holds 117 elements in a very distinct order for the purpose of showing similarities and differences in chemical properties. Out of all of the elements, 94 are found in nature and the other 24 were synthetically produced with particle accelerators. As well, most copies of the periodic table separate the metal and non-metal elements with a dark stair-step line. In general, the metals are on the left and the non-metals on the right and elements within one row (period) with similar behavior in the same column. Additionally, elements are placed in order of increasing atomic number, which is the number of protons in the nucleus of the element's atom. The rows are also organized so that elements with similar properties are found in the same columns.

Within each element square, information on the element's symbol, atomic number, atomic mass, electronegativity, electron configuration, and valence numbers can be found.

At the bottom of the periodic table is a two row block of elements that contain the lanthanides and actinides. These groups are classified as inner transitional metals.

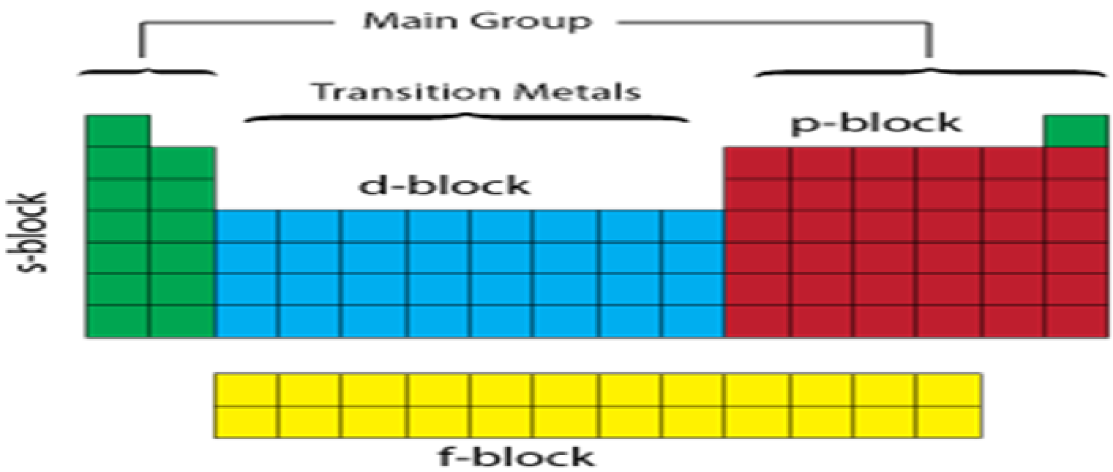
The rows of the table are called periods; the columns are called groups. Six groups (columns) have names as well as numbers: for example, group 17 elements are the halogens; and group 18, the noble gases. The periodic table can be used to derive relationships between the properties of the elements, and predict the properties of new elements yet to be discovered or synthesized.



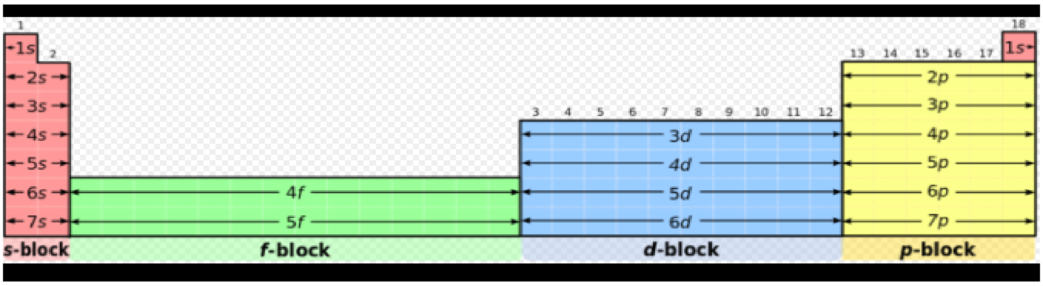
CLASSIFICATION

The chemical elements classified into groups, periods, and blocks. Groups, also referred to as a families, are the vertical columns located on the periodic table. Groups are considered to be the most significant form of classification. Many groups contain elements with very similar properties and are referred to with special names such as the halogens and alkaline earth metals.

Periods are made up of the horizontal rows of the table. Just as groups contain specific trends in similar properties, so do periods. For instance, the d-block contains a row of transition metals. Blocks are important as different regions of the periodic table due to the outer shell of elections within the elements' atoms. Blocks are oriented based on this outer shell. The blocks of the periodic table include the s-block, p-block, d-block, and f-block. Other groupings include poor metals, transitional metals, metalloids, and the platinum group.



Specific regions of the periodic table can be referred to as blocks in recognition of the sequence in which the electron shells of the elements are filled. Each block is named according to the subshell in which the "last" electron notionally resides. The s-block comprises the first two groups (alkali metals and alkaline earth metals) as well as hydrogen and helium. The p-block comprises the last six groups, which are groups 13 to 18 contains, among other elements, all of the metalloids. The d-block comprises groups 3 to 12 contains all of the transition metals. The f-block, often offset below the rest of the periodic table, has no group numbers and comprises lanthanides and actinides.



CHEMICAL PROPERTIES

The location of elements on the periodic table is extremely important due to the trends of chemical properties in groups and rows. Properties of an element can actually be predicted based on its table location. It is important to remember that trends operate differently when moving vertically and horizontally along the table.

Trends within groups are explained by common electron configuration in their valence shells. This also creates likenesses in atomic radius, electronegativity, and ionization energy. From the top of the group to the bottom, atomic radii of the elements increase. Since there are more filled energy levels, valence electrons are found farther from the nucleus. From the top, each successive element has a lower ionization energy because it is easier to remove an electron since the atoms are less tightly bound. Similarly, a group has a top to bottom decrease in electronegativity due to an increasing distance between valence electrons and the nucleus.

Likewise, Elements in the same period show trends in atomic radius, ionization energy, electron affinity, and electronegativity. Moving left to right across a period, atomic radius usually decreases. This occurs because each successive element has an added proton and electron, which causes the electron to be drawn closer to the nucleus. This decrease in atomic radius also causes the ionization energy to increase when moving from left to right across a period. The more tightly bound an element is, the more energy is required to remove an electron.

Electronegativity increases in the same manner as ionization energy because of the pull exerted on the electrons by the nucleus. **(Electronegativity is the tendency of an atom to attract electrons).** An atom's electronegativity is affected by both its atomic number and the distance between the valence electrons and the nucleus. The higher its electronegativity, the more an element attracts electrons.

Electron affinity also shows a slight trend across a period. **(The electron affinity of an atom is the amount of energy released when an electron is added to a neutral atom to form a negative ion)**.

Metals (left side of a period) generally have a lower electron affinity than nonmetals (right side of a period), with the exception of the noble gases. Ionization energy and electronegativity decrease due to electron