

Chem11 Intro, Periodic Table : Notes-20

The elements were defined by Robert Boyle to be substances that cannot be broken down into simpler substances. In the Periodic Table they are arranged from left to right in rows and columns according to increasing atomic number. (It was originally according to atomic weight). Each row is called a period. Each column is called group. All elements in a group have similar properties.

The two major classes of elements are the metals and the non-metals. The metals are on the left of the staircase, (between Boron and Astatine), the non-metals are on the right. Another class of elements near the staircase are the metalloids (also called semi-metals or semiconductors, e.g. B, Si, Ge, As, Sb and Te).

The metals are good conductors (of heat and electricity), are shiny, ductile (can be drawn into wires), and malleable (can be beaten into sheets). The non-metals are poor conductors, and are not shiny, ductile, or malleable. Semiconductors have intermediate properties.

Several elements were discovered long ago. These are (mostly) metals with a low melting point (Au, Ag, Cu, Fe, Pb, C, Hg, S, Sn, Zn). There are now more than 105 known elements. Some of these are unstable.

Elements to the left and down are more metallic. For example, Fe and Ag are both more metallic than Cu.

At room temperature and standard pressure (one atmosphere) most elements are solid. Two elements, Hg and Br are liquid. The gaseous elements are H, N, O, F, Cl and the Inert (Noble) gases, He, Ne, Ar, Kr, Xe, and Rn.

The gases H, N, O, F, and Cl all form diatomic molecules; H_2 , N_2 , O_2 , F_2 and Cl_2 . Some solid (and liquid) elements when heated also form diatomic molecules (Br_2 , I_2 and At_2).

The Noble gases are monoatomic.

Sulfur forms S_8 molecules and P forms P_4 molecules. All other elements form mono-atomic gases when heated.

The element Hydrogen is considered "special" because it can act as a group 1a (metallic) element (like Li, Na, ...) or a group 7b (non-metallic) element (like F, Cl, ...).

Periods 6 and 7 have extra elements, the lanthanide series and the actinide series, respectively. These are placed at the bottom of the periodic table so as not to make the table too long.

The Chemical Symbols are abbreviations for the names of the elements. These are usually the first one or two letters of the Latin or Greek name. The name may represent a place, a scientist, or even a god. The common name may be different from the Latin or Greek name. (e.g. Lead has a symbol Pb, which comes from the Latin name Plumbum).

Other information in the periodic table.

Atomic Number	This is the number of protons in the atom. If the atom is neutral, the number of electrons equals the number of protons.
Atomic Mass (Weight) (in A.M.U.'s)	This is the average number of protons and neutrons in an atom. H has a mass of about 1.0 A.M.U.'s. Oxygen has a mass of about 16 A.M.U.'s. Carbon has a mass of about 12 A.M.U.'s. (e.g. C is about 12 times as heavy as H). A.M.U. means Atomic Mass Units.
Combining capacity (or oxidation state)	This is the number of electrons an atom gains or loses when it becomes an ion. It is positive or negative) Some elements have more than one oxidation number.