

## PERIODIC TABLE OVERVIEW

The elements are arranged in rows and columns on the periodic table, according to similarities in their properties. The arrangement shows an increase in the atomic number or number of protons in the nucleus. Changing the number of protons, the atomic number, changes the identity of an element.

A column of elements in the periodic table is called a group, designated by a number-letter combination. Another system of naming groups is by using counting numbers, 1-18, for the groups. You will see both being used. The Group A elements (Groups 1, 2, 13-18) are called the representative elements because they show the full range of chemical properties.

<u>GROUP NUMBER</u>	<u>SPECIAL NAME</u>	<u>CHARGE</u>
Group IA (1)	alkali metals	1+
Group IIA (2)	alkaline earth metals	2+
Group IIIA (13)	-----	some 3+
Group IVA (14)	-----	varies; metals 2+, 4+
Group VA (15)	-----	3-
Group VIA (16)	chalcogens	2-
Group VIIA (17)	halogens	1-
Group 0 / VIIIA (18)	Noble Gases (inert)	0 (none)

Metals are elements that have a high luster or shine when clean and high electrical conductivity. They are ductile, which means they can be drawn into wires. They are also malleable, which means they can be hammered into thin sheets. Most elements are metals. Metals as a group include the transition metals—the Group B elements—and the rare earths or inner transition metals. The inner transition metals include the Lanthanide series (atomic # 57-70) and Actinide series (atomic #89-102).

Nonmetals are grouped in the upper right-hand corner of the chart. They are nonlustrous and poor conductors. Hydrogen, when placed in Group IA, is the only nonmetal on that side of the chart.

Metalloids or semimetals have properties of both metals and nonmetals. They are “semiconductors” and are found bordering the staircase that separates the metal/nonmetal regions of the chart. The metalloids are B, Si, Ge, As, Sb, Te, Po.

Mendeleev’s Periodic Law states that properties of elements are a periodic function of their atomic numbers. The chart groups elements together based on similar properties; there are observable relationships to size, electron affinity, and other properties as one examines a group or a period.

### PREDICTING OXIDATION NUMBERS (CHARGES) USING THE CHART:

Cations: The elements of Group IA (1), due to their structures, have 1 electron in the outer shell. This is easily lost in ion formation, so these metals form 1+ ions. For the same reasons, the metals of Group IIA (2) form 2+ ions and some of Group IIIA (13) form 3+ ions. The transition elements exhibit oxidation numbers from 2+ to 7+.

Anions: Elements that form negative ions gain as many electrons needed to complete the outer shell. As an example, the elements in Group VA (15) have 5 electrons in the outer shell; they gain three to fill the shell, forming 3- ions. The Noble Gases in Group VIIIA (18) have all eight valence electrons, so they do not form ions.