

Valence Electrons

Valence electrons are those in the outermost energy shell of an atom. They are the ones that participate in bonding and chemical reactions.

Octet Rule – atoms want to have completely filled outer energy shells. To be completely filled, they need 8 electrons in the outer shell. Exceptions to the rule – Hydrogen and Helium (only need 2)

To determine the number of valence electrons – count up how many electrons are in the outermost s and p orbitals. This can be done from the electron configuration of an atom, or from the periodic table.

Groups 1 and 2 correspond to their number of valence electrons. Groups 13-18 also correspond to their number of valence electrons (minus 10). All atoms in the d and f blocks have 2 valence electrons.

Lewis Dot Structure – only shows the number of valence electrons an atom has.

Ion – charged atom

Cation – positively charged

Anion – negatively charged

Periodic Trends – The periodic table is arranged according to atomic number (number of protons), however, the periods are arranged based on similarities in structure and reactivity. As such, there are trends witnessed regarding structure and size.

Atomic radius – decreases from left to right, increases from top to bottom.

Ionic radius – decreases from left to right (but starts over around group 15), increases from top to bottom.

Ionization energy – increases from left to right, decreases from top to bottom.

Electronegativity – increases from left to right, decreases from top to bottom. (F is most EN atom)