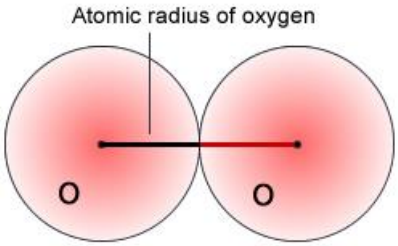
Vocabulary: Periodic Trends

Vocabulary

- Atomic radius – the distance from the nucleus to the outermost edge of the electron cloud.
  - The atomic radius can be determined by measuring the distance between two adjoining nuclei in a molecule comprised of two identical atoms, and then dividing by two.
  - For nonmetallic atoms that do not form diatomic molecules, the radius is determined by measuring the radius of atoms in covalent compounds.



  - For metallic atoms, the radius is determined by measuring the radius of atoms in metallic crystals.
  - The *Periodic Trends* Gizmo uses calculated atomic radii established by Enrico Clementi and others in 1967.

- Electron affinity – the change in energy that occurs when an electron is added to a neutral atom in the gaseous state, measured in kJ/mol.
  - Electron affinity refers to the tendency of an atom to attract electrons.
  - An element with a strong attraction for electrons will have a high negative electron affinity, since energy is released when an electron is added. The greater the magnitude of the negative electron affinity value, the stronger the attraction for electrons.

- Electron cloud – the region occupied by fast-moving electrons that surrounds the nucleus of an atom.
  - The electron cloud can be considered a probability distribution representing the space where electrons are most likely to be found.

- Energy level – a discrete region of space within the electron cloud where electrons are most likely to be found.
  - The number of principal energy levels within an atom is equal to that atom's period number on the periodic table.
  - There are a maximum of 7 principal energy levels within an atom

- Group – a vertical column in the periodic table, numbered 1 to 18.
  - Groups are also called families.
  - Elements in the same group have the same number of valence electrons and similar chemical properties.

- Ion – an electrically charged atom that has gained or lost one or more electrons.
    - An atom with more protons than electrons is a positively charged ion, or cation.
    - An atom with more electrons than protons is a negatively charged ion, or anion.
    - In an element symbol, the electric charge is shown as a superscript at the upper right. For example, Be^{2+} is an ion of beryllium with a charge of positive 2.

- Ionization energy – the energy needed to remove an electron from an atom or ion in its gaseous state, measured in kJ/mol.
    - Ionization energy refers to an atom's tendency to hold on to its electrons.
    - The lower an atom's ionization energy, the more likely that atom is to lose electrons.
    - The first ionization energy is the energy needed to remove a single valence electron from an atom, the second ionization energy is the energy required to remove an additional valence electron, etc. Ionization energy increases with the removal of each successive electron.

- Metal – an element that is malleable and usually conducts heat and electricity well.
    - Metal atoms tend to hold electrons loosely.
    - Metal atoms tend to lose electrons, forming positive ions.
    - Metals typically have a low ionization energy and a low electron affinity.

- Nonmetal – an element that is generally a poor conductor of heat and electricity.
    - Nonmetal atoms tend to hold electrons tightly.
    - Nonmetal atoms tend to gain electrons, forming negative ions.
    - Nonmetals typically have a high ionization energy and a high electron affinity.

- Nucleus – the positively charged, dense central core of an atom.
    - The total number of particles (protons and neutrons) in the nucleus is given by the atom's mass number.
    - The nucleus contains over 99.9% of an atom's mass, but only occupies about 1/100,000 of its volume.

- Period – a horizontal row in the periodic table, numbered from 1 – 7.
    - Elements within the same period share the same number of principal energy levels.

- Periodic trend – a predictable pattern in the periodic table, either down a group or across a period. Atomic radius, ionization energy and electron affinity are examples of trends.

- Picometer – unit of length used to measure atomic radius that is equal to one-trillionth (10^{-12}) of a meter.

- Valence electron – an electron found in the outermost energy level of an atom.