Periodic Trends

I. **Atomic/Ion Radius**: 1/2 the distance between two alike atoms nuclei. It is determined by the size of the orbitals occupied by the outermost electrons.
   1. Trend: top to bottom (down): increases
   2. Trend: top to bottom (cut): increases
   3. Trend: left to right (across): decreases

   Atom vs Ion radius:
   1. Cation vs atom: Cation is smaller
   2. Anion vs atom: Anion is larger

II. **Ionization energy**: minimum amount of energy needed to remove an electron from the ground state of the isolated gaseous atom or ion.
   A. First ionization energy: the energy needed to remove the first electron from a neutral electron.
      $Na(g) \rightarrow Na^+(g) + 1e^-$
      1. Trend: top to bottom: decreases
      2. Trend: left to right: increases

   B. Second ionization energy: the energy needed to the second electron from an ion.
      $Na^+(g) \rightarrow Na^{2+}(g) + 1e^-$
   C. The greater the energy the harder it is to remove an electron
   D. Basically a measure of how easily an atom loses an electron

III. **Electron Affinity**: measure of the energy change when an electron is added to a gaseous atom (opposite of ionization energy)
   A. Most atoms energy is released
   B. $Cl(g) + 1e^- \rightarrow Cl^-$ $\Delta H = -349$ kJ/mol
   C. Basically a measure of how easily atom gains an electron
      1. Trend: top to bottom: decreases
      2. Trend: left to right: increases

IV. **Electronegativity**: ability of an atom to attract electrons to itself; related to ionization energy and electron affinity. An atom with high ionization energy and a very negative electron affinity will be highly electronegative.
   A. Basic Trend:
      1. Trend: top to bottom: decreases
      2. Trend: left to right: increases

V. **Chemical Reactivity**: how reactive an element is with other elements/compounds
   A. Basic Trend:
      1. Trend: top to bottom (left side): increases
      2. Trend: top to bottom (right side): decreases