

1.5 Trends in the Periodic Table

Definitions

- Atomic radius
- Ion
- Ionization energy
- Electron affinity
- Electronegativity

Describing Trends in the Periodic Table

- Elements in the same group show similar trends but they are not identical. There is a predictable variability.
- Some trends
 - Alkali metals and halogens are most reactive and the transition elements tend to be least reactive.
 - Metals react differently than non-metals
 - Reactivity increases as you move down a group. (metals only)

Atomic Radius

- Radius decreases from left to right because as we add protons to the nucleus we are also adding electrons. Therefore the attraction is greater and the atom is smaller.
- Radius increases from top to bottom because of shielding. As each valence shell is filled it moves the next energy level further out and as the distance from the nucleus to the valence electrons increase the attraction decreases.

Ionic Radius

- Cations become smaller when they lose electrons. This is because the repulsion between the valence electrons decreases while the attraction to the nucleus remains the same. This allows the remaining electrons to get closer to the nucleus.
- Anions become larger when they gain electrons. This is because the repulsion between the valence electrons increase while the attraction to the nucleus remains the same. This forces the electrons to get further from the nucleus.

Ionization Energy

- This is the amount of energy needed to remove an electron from an element in the gaseous state.
- First ionization energy is the amount of energy required to remove the first electron from an atom. The subsequent ionization energies increase because cations are formed with a smaller radius. The smaller radius makes it difficult to remove additional electrons.
- First ionization energy increases from bottom to top and from left to right.

Electron Affinity

- Electron affinity can be considered as the amount of energy an atom is willing to pay to buy another electron.
- It is the amount of energy released when an electron is added to an atom.
- A positive value is a release of energy and a negative value is an increase in energy.
- Electron affinity does not really follow a trend but it increases as you go from left to right and from bottom to top.

Electronegativity

- The ability for an atom to gain an electron.
- F is considered the most electronegative and is given a value of 4.
- Electronegativity increases from bottom to top and from left to right

Review

- Read the summary on page 58.

Homework

- Read 1.5
- Practice: 1,2,3,4,5,6
- Section Q's: 1,2,3,4,5,6
- Review for test: All relevant review questions on page 62-63