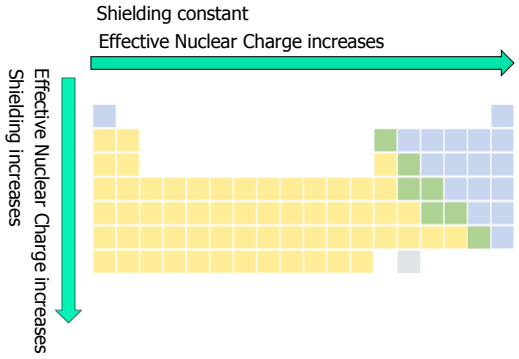
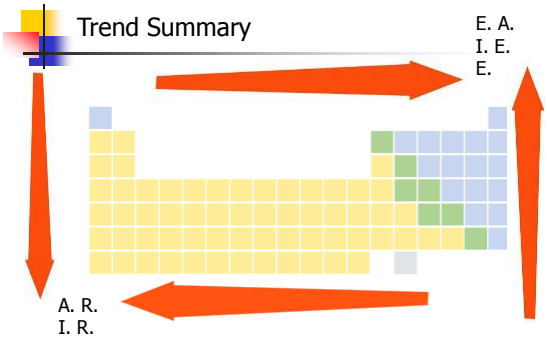
Periodic Trends

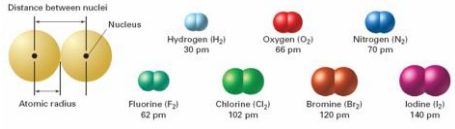
- **Shielding electrons** are the **electrons** in the energy levels between the nucleus and the valence **electrons**. They are called "**shielding**" **electrons** because they "**shield**" the valence **electrons** from the force of attraction exerted by the positive charge in the nucleus.
- The **effective nuclear charge** is the net positive **charge** experienced by valence electrons. It can be approximated by the equation: $Z_{eff} = Z - S$, where Z is the atomic number and S is the number of shielding electrons.





Atomic Radii

- The **atomic radius** is one half of the distance between the nuclei of two atoms of the same element when the atoms are joined.

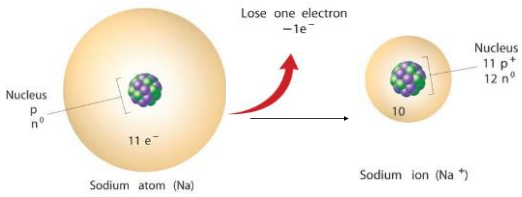


•Increases from R to L and top to bottom

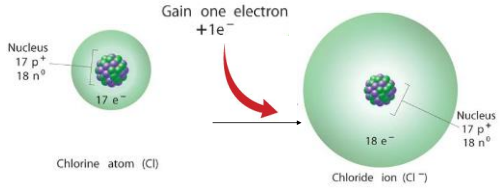
Ionic Radii compared to Atomic Radii

- Metals tend to lose e- forming (+) ions
  - Positive nuclear charge pulls in remaining e- therefore reducing ionic radius below atomic radius
- Nonmetals tend to gain e- forming (-) ions
  - Negative nuclear charge increase inner e- repulsion therefore ionic radius increases beyond atomic radius
    - •Increases from R to L and top to bottom

Positive ion



Negative ion



Ionization Energy

- The energy required to remove an electron from an atom is called **ionization energy**.
  - 1st I.E. – min. amount of energy required to remove the most loosely bound e-
  - 2nd I.E. – min. amount of energy required to remove the 2nd e-
- Low ionization energy indicates ease of e- removal
- Increases from bottom to top and L to R

Electron Affinity

- The energy change that occurs when an electron is acquired by a neutral atom is called **electron affinity**.
- Elements with high negative e- affinities gain e- more easily.
- Increases from bottom to top and L to R

Electronegativity

- **Electronegativity** is a measure of the ability of an atom in a chemical compound to attract electrons from another atom in the compound.
- Used to make predictions about bonding
  - large electronegativity difference = ionic bonds
  - small electronegativity difference = covalent bonds
- Increases from bottom to top and L to R
- F – most electronegative element
  O – 2nd most electronegative element

Trend Summary