

Student Handout 2 of 3: Periodic Law

Ionic radius:

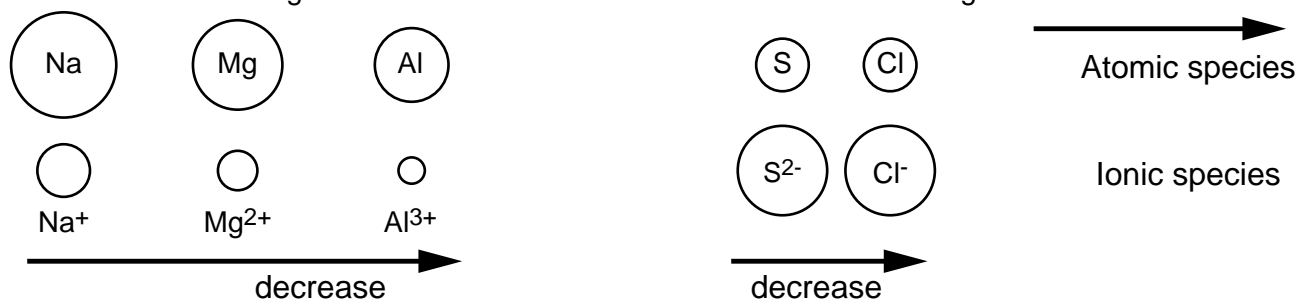
Shielding doesn't help much here but the same electrostatic force idea used to explain shielding does work. This is really tricky business because you have to look at what happens to atoms and their ions separately and then try to look at the trends in ionic radius for the periodic table as a whole.

Cations: get smaller than the atomic species because you lose outer electrons (often complete sublevels) and the net positive charge draws in the remaining electrons.

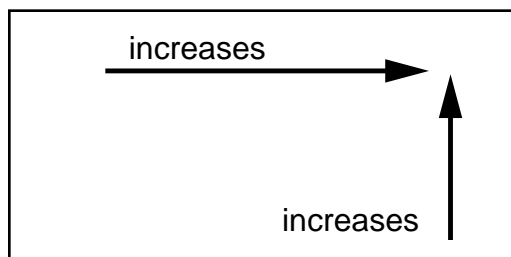
Anions: you gain electrons and they repulse each other. The ionic radius expands out to accommodate the repulsive forces.

For the Periodic Table

As with atoms, the size of ions increase as you go down the periodic table but cations (decrease in size) get smaller than anions (increase in size) and this contradicts the trend for the same atomic species. This behavior is a result of the nonuniformity of stable ionic charge across chemical groupsite. The alkali metals have stable ions of +1 charge while the alkaline earth metals ions have +2 charges.



Ionization energy: This is the energy required to remove the outermost electron. The larger the unshielded charge on the nucleus the bigger I.E. Watch out for jumps that occur because of orbital stability issues. Like when you lose a lone p-electron and then try to remove the next electron from a full s-sublevel. That will require a big jump in energy because the full s-sublevel is a stable configuration.



Electron Affinity/Electronegativity : These are both measures of how strongly an atom can attract an additional electron --> the greater the difference between the shielded nucleus and the outer electrons the higher the electron affinity and electronegativity. The two aren't the same thing, they just kind-of describe the same characteristics. Electron affinity is a physical characteristic whereas electronegativity was made up by Linus Pauling as a means of predicting bond polarity between atoms in molecules.

