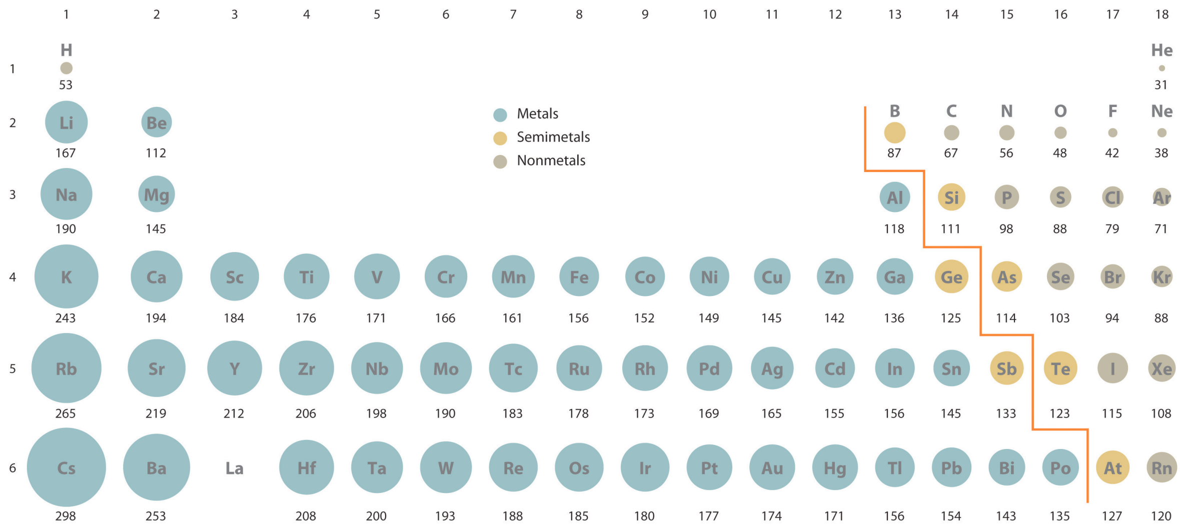
Mendeleev
- First periodic table arranged by atomic mass
- Changed to atomic number

Coulomb's law
- Strength of the interaction between charges depends on the magnitude of the charge and the distance between the charges

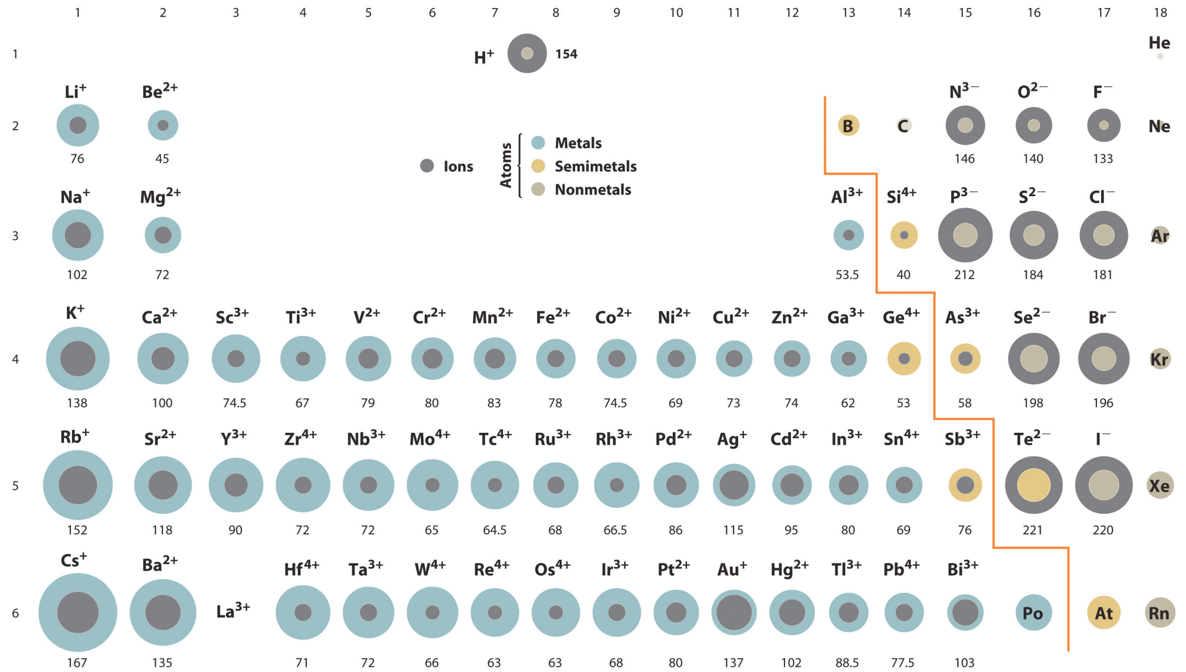
2 Key Ideas of Periodic Tables
- Nuclear charge pulls the electrons closer as you go across a period
- Electron repulsion pushes electrons away as you go down a group

Atomic Radii – Size of Atom



across a period (horizontally): nuclear charge: # of protons in nucleus increase = stronger magnitude of positive charge = stronger attractions to the electrons = shrinks the atomic radii
across a group (vertically): more energy levels = increasing distance; electrons in the filled shell repulse electrons in the other shell

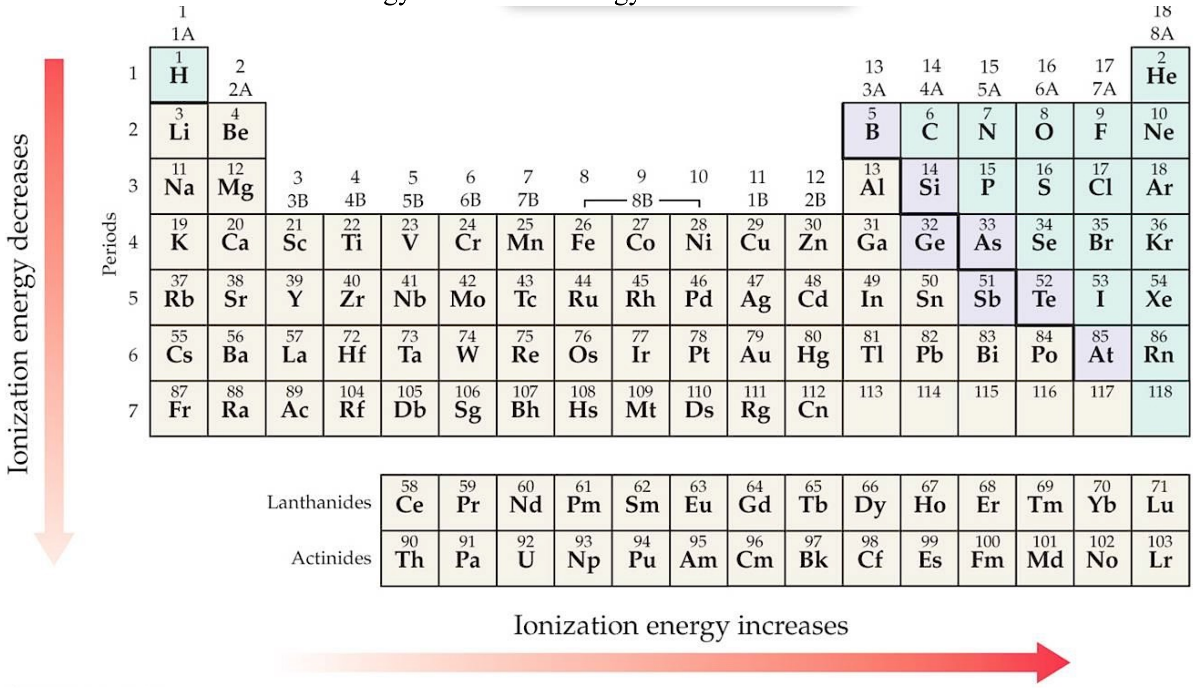
Ionic Radii – radius of Cation



cation is smaller than the parents: loses electrons
anion is bigger than the parents: gains electrons

across period: adds number of protons
Isoelectronic series: group of ions that share the same number of valence electrons
$Na^{+}Mg^{2+}Al^{3+}$ O^{2-} F^{-} = [Ne]

Ionization Energy – minimum energy needed to remove an electron



across a period: ionization energy increase: harder to remove an electron because strong nuclear charge holds onto electrons
across a group: ionization energy decrease: electrons are farther from the nucleus, weaker attraction to nucleus = easier to remove an electron
*electrons are removed from the highest energy level

Fe ([Ar] 4s2 3d6) = Fe2+ ([Ar] 3d6)

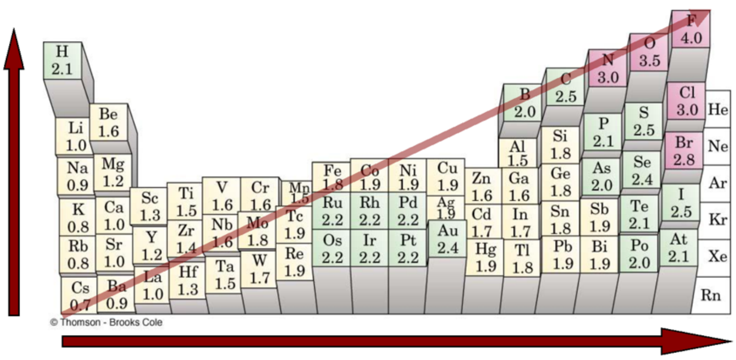
Electron Affinity

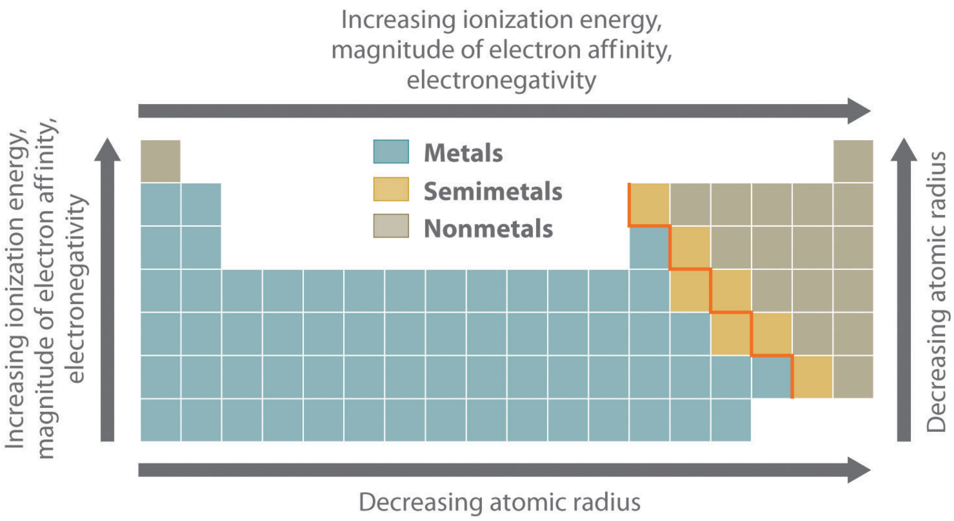
Metals: Metals like to lose valence electrons to form cations to have a fully stable octet. They absorb energy (endothermic) to lose electrons. The electron affinity of metals is lower than that of nonmetals.

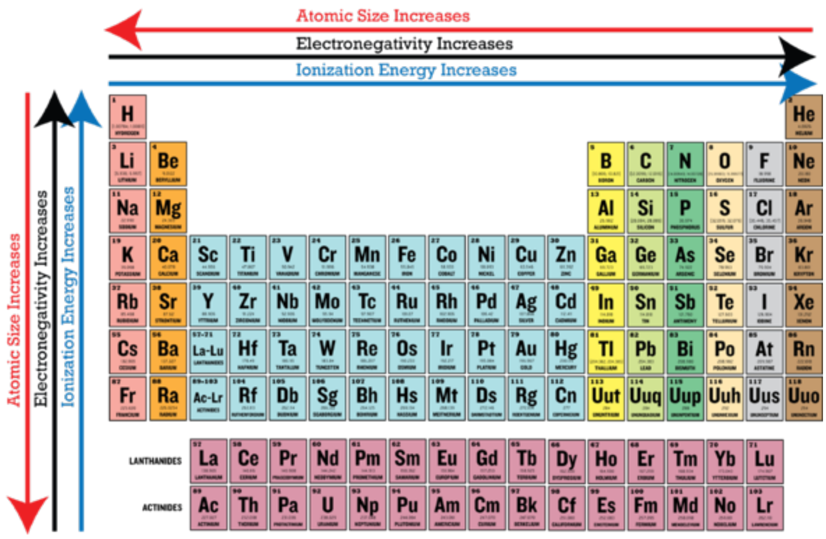
Nonmetals: Nonmetals like to gain electrons to form anions to have a fully stable octet. They release energy (exothermic) to gain electrons to form an anion; thus, electron affinity of nonmetals is higher than that of metals.

Electronegativity

The Periodic Table and Electronegativity







Chapter 8

Ionic bonding (transfer)

Metal + nonmetal

Cation + anion

Properties:

- High melting and boiling points
- Dissolve in H2O
- Can generate electricity in H2O or in their melted state (because electrons can move around)
- Brittle
- Crystalline
- Cleave: split/shatter along lines of the crystal

Covalent bonding (share)

Nonmetals + nonmetals

Properties:

- Low boiling and melting points
- Can be gases, liquids, solids at room temperature

Metallic bonding: two or more metals together

Properties:

- Low ionization energies
- Side note: Why doesn't metal shatter? The electrons in object move around allowing it to bend instead of breaking

Lattice structure

Lattice energy: energy to break ionic bonds

Higher lattice energy: stronger the bond

ΔHf = change in energy