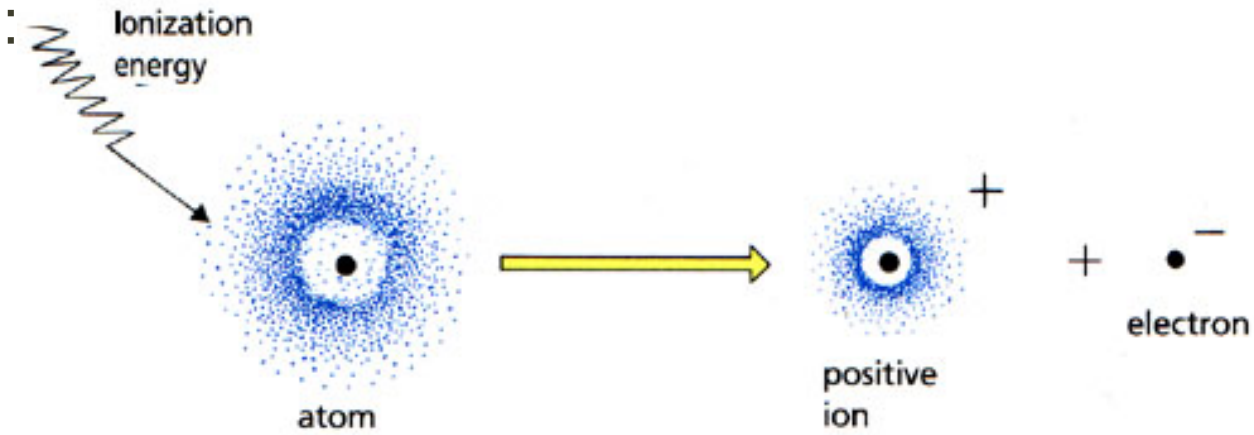
Periodic Trends

Part III:
Ionization Energy Trends
Electronegativity Trends
Electron Affinity Trends

Which should have the LARGER radius?

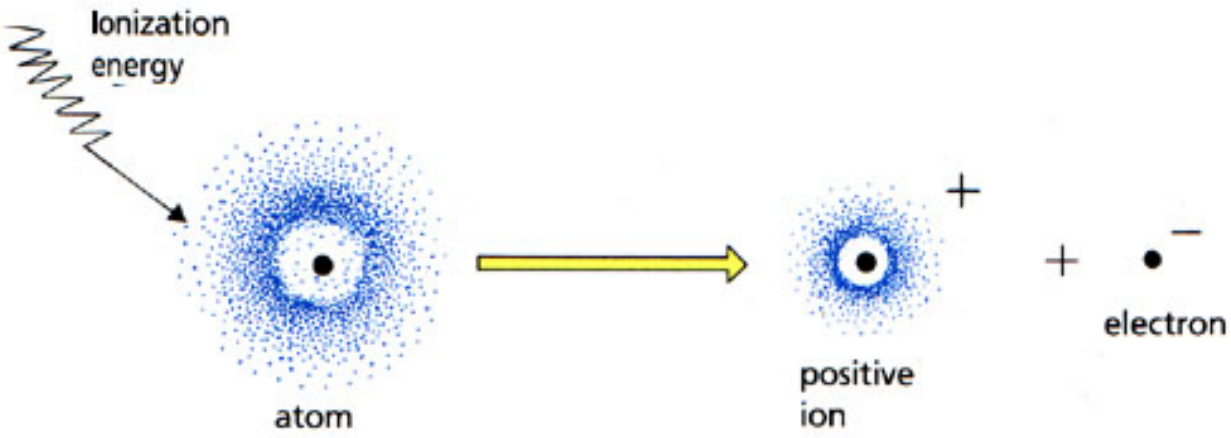
- Cs^{+} or Li^{+}
- Mg^{2+} or F^{-}
- O^{2-} or N^{3-}
- K^{+} or Ti^{2+}

Ionization Energy



Ionization Energy

- Definition:



Patterns

- What elements tend to lose electrons?

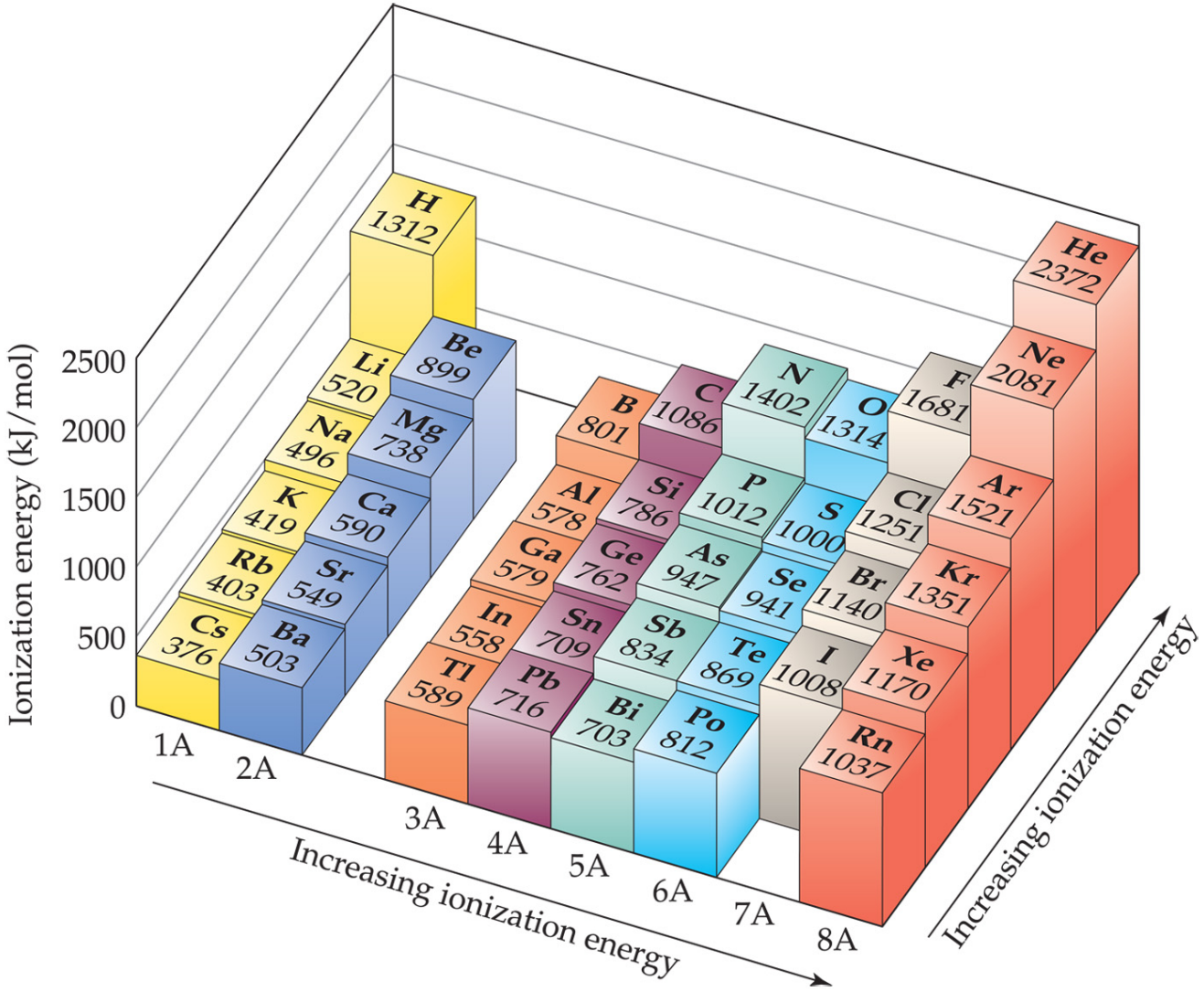
Patterns

- What elements tend to gain electrons?

Ionization Energy trends

- Look at your graphs!
- Period trend
- Group trend

Ionization Energy



Ionization Energy

- First Ionization Energy
- Second Ionization Energy

Multiple ionization energies

- IE_1
- IE_2

- 2nd ionization energy is usually much larger than the 1st ionization energy
  - Atoms/ions don't easily disrupt noble-gas like electron configurations

Electronegativity

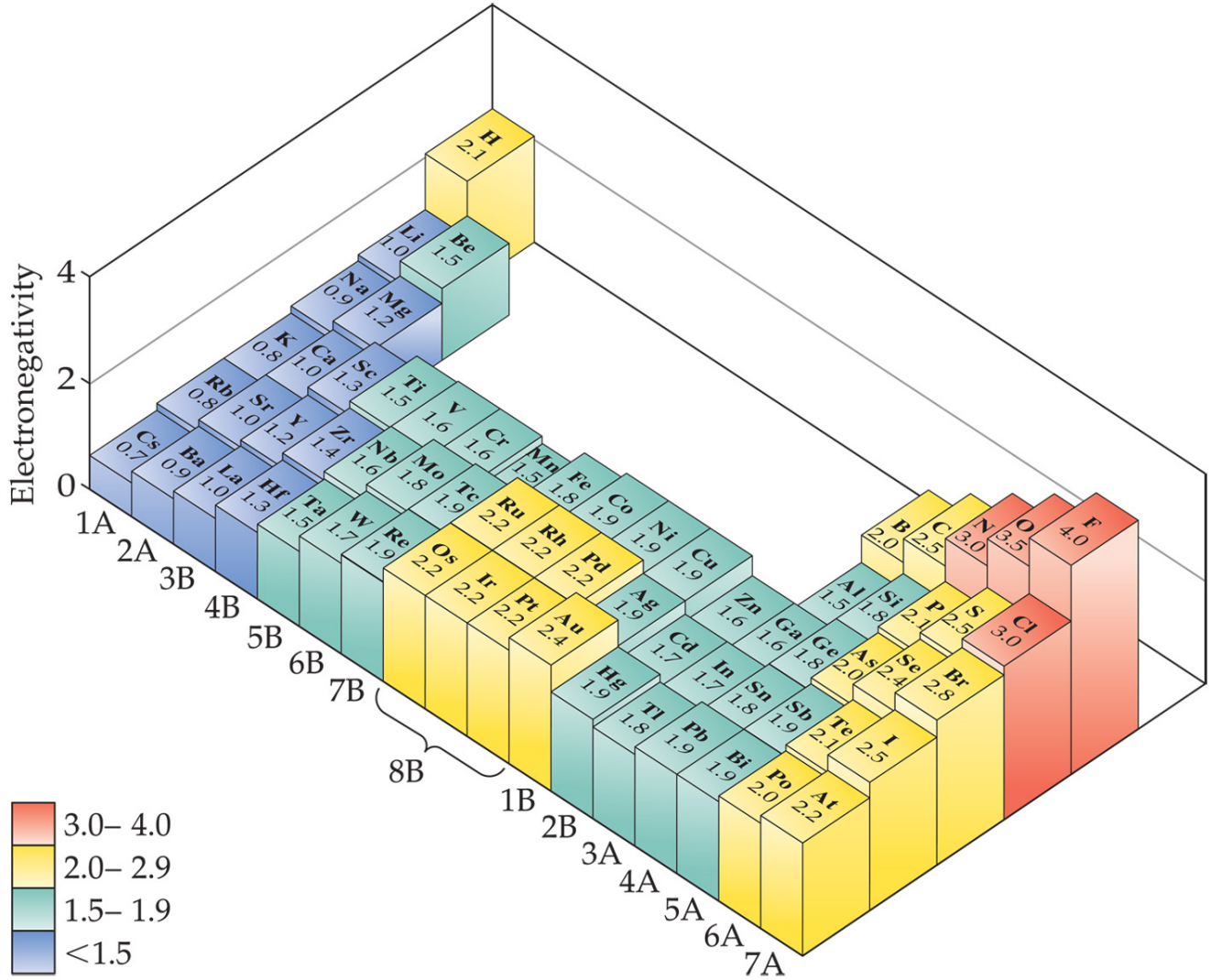
- Definition:

Electronegativity

- Most electronegative element:

- Least electronegative element:

Electronegativity Trends



Electronegativity

- Period Trend:

- Group Trend:

Electron Affinity

- Definition:

Electron Affinity

- Metals typically have a low electron affinity.
  - (-) EA: electrons are repelled!
    - Pushing additional electrons away

Electron Affinity

- Nonmetals typically have a high electron affinity.
  - (+) EA: wants to gain electrons

Electron affinity

- Group trend:
  - Electron affinity DECREASES down a column

Electron affinity

- Group trend:
  - Electron affinity DECREASES down a column
    - Decreasing attraction for electrons as shielding increases

Electron affinity

- Period trend:
  - Electron affinity INCREASES L→R across a period

Electron affinity

- Period trend:
  - Electron affinity INCREASES L→R across a period
    - Greater attraction for electrons as Z_{eff} increases

Examples of EA trends

- Be EA = -241 kJ/mol
  - Filled 2s orbital
    - To gain an electron, it must go into the higher energy 2p sublevel
- Ne EA = -29 kJ
  - No attraction for additional electrons
    - It's already stable, with a filled octet