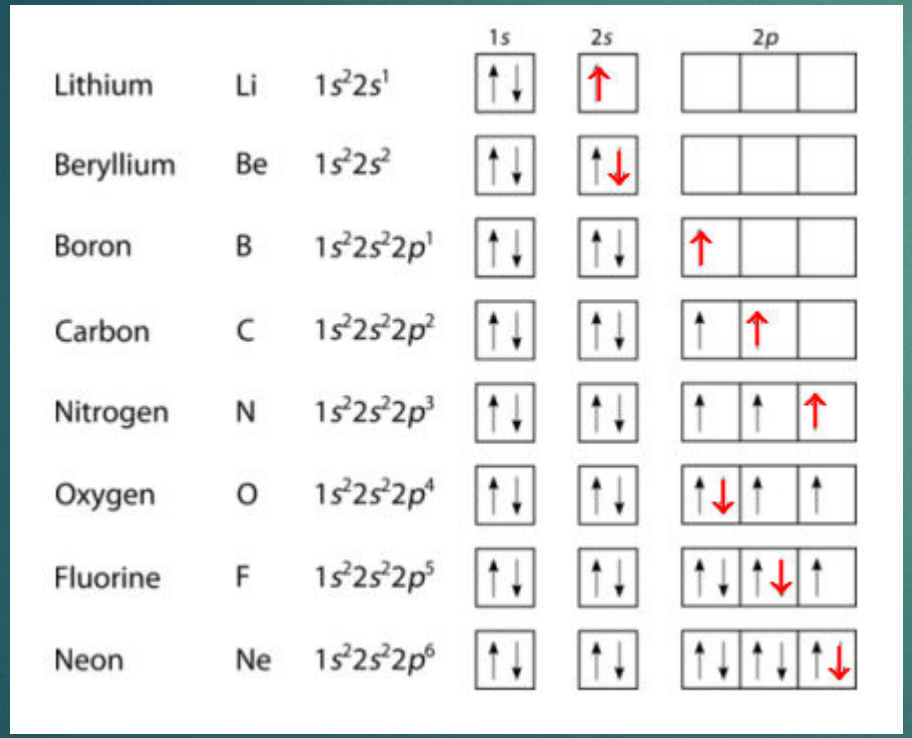
Ionization Energy

UNIT 3 PERIODIC TRENDS

First Ionization Energy

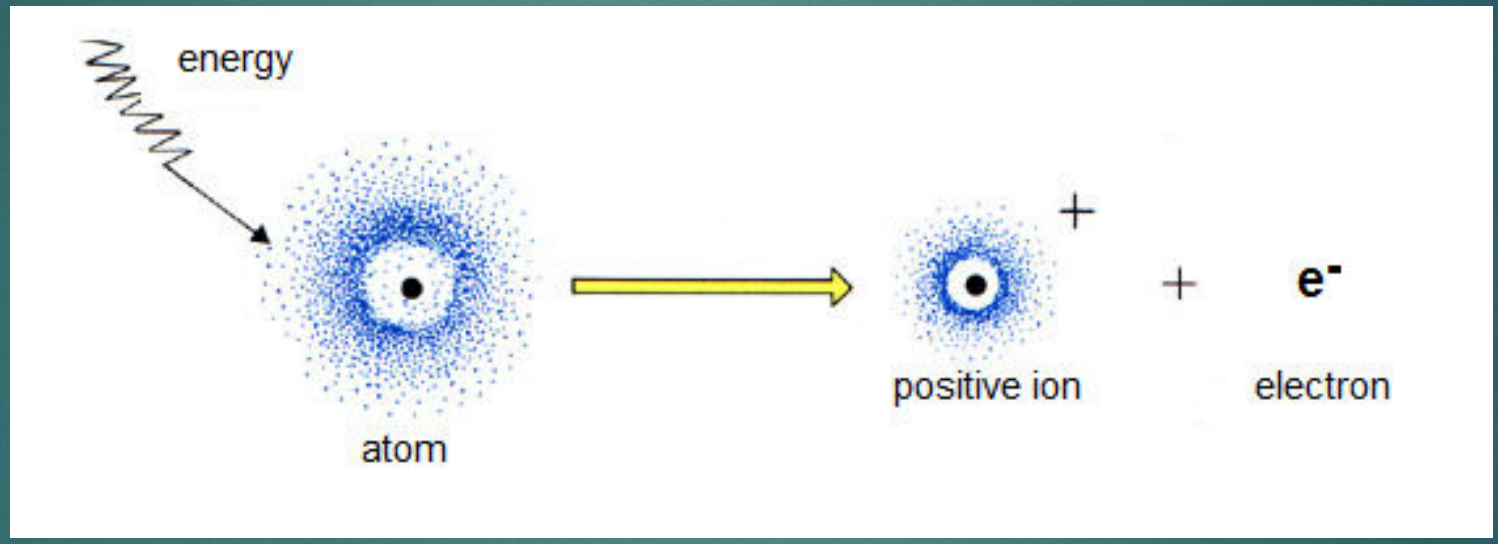
- **First Ionization Energy** is the amount of energy required to remove the ***first*** valence electron



- If removing an electron completely empties an orbital, then the atom becomes more stable.
- This happens for Lithium and Boron.
- Oxygen also becomes more stable because each p orbitals is only filled once.

Metals vs Nonmetals

- Metals ***lose electrons*** easily so they require ***less*** ionization energy.
- Nonmetals want to ***gain electrons*** so losing them requires ***more*** energy.

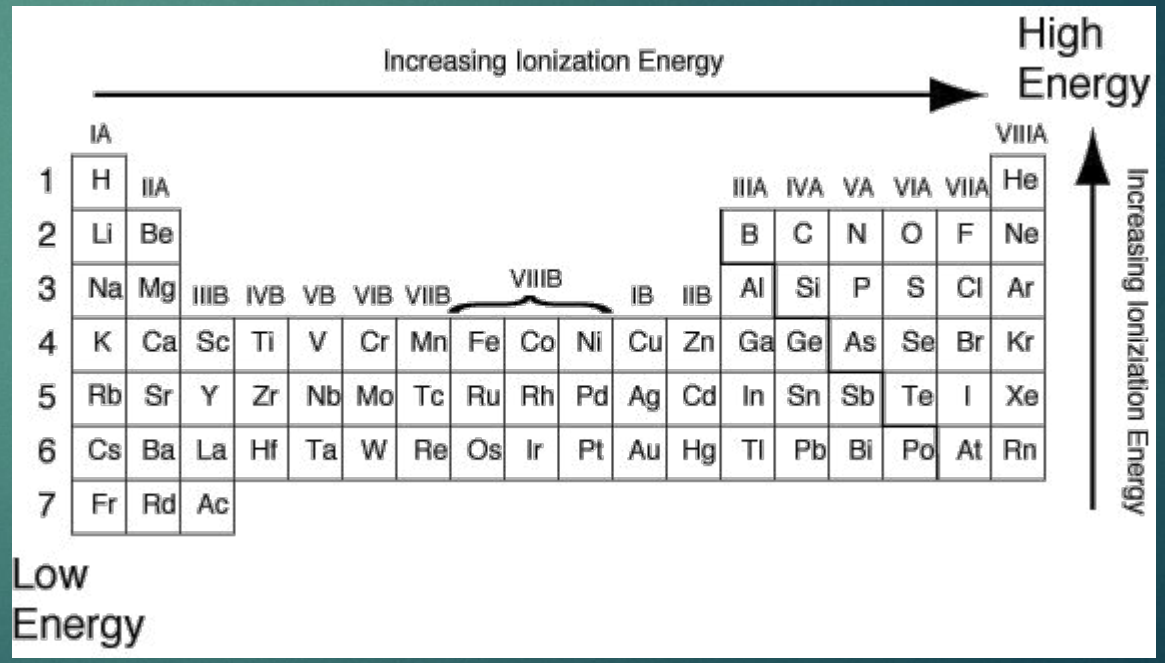


- The process of removing an electron is always ***endothermic***.

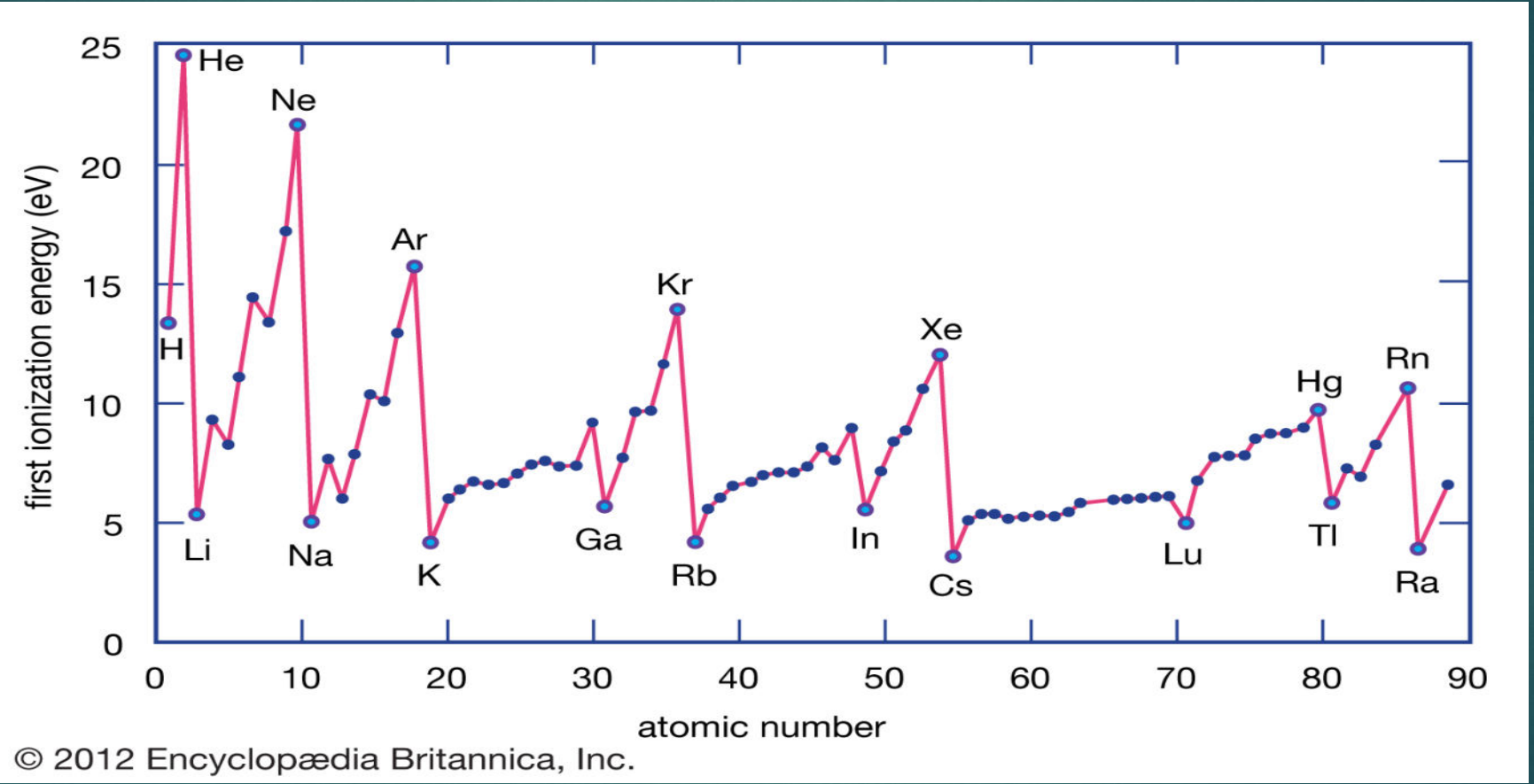
Ionization Energy of Noble Gases

- **Noble gases** have the ***highest*** ionization energy because their **valence orbitals are full** and they do not want to lose electrons.

Helium	He	$1s^2$
Neon	Ne	$1s^2 2s^2 2p^6$
Argon	Ar	$1s^2 2s^2 2p^6 3s^2 3p^6$
Krypton	Kr	$[Ar]\ 4s^2 3d^{10} 4p^6$
Xeon	Xe	$[Kr]\ 5s^2 4d^{10} 5p^6$
Radon	Rn	$[Xe]\ 6s^2 5s^{10} 6p^6$

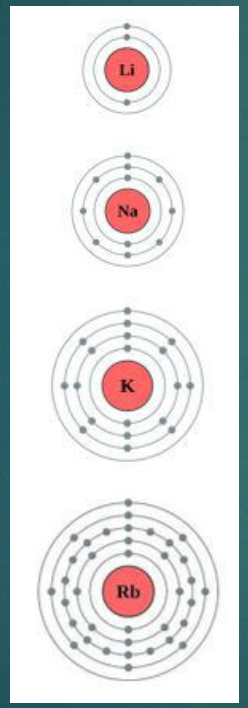


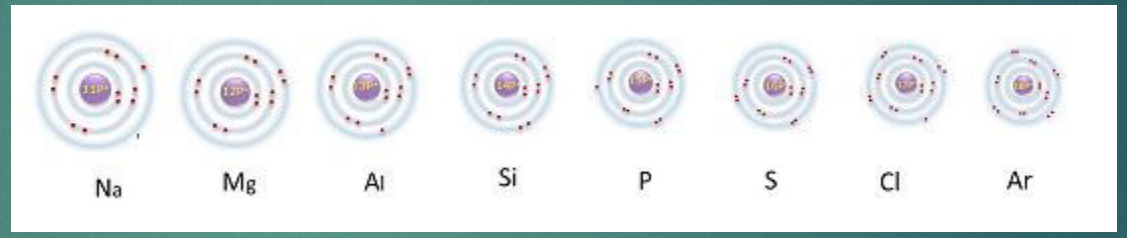
Ionization Energy and Atomic



Ionization and Atomic Radius

- The ***smaller*** the atom, the ***harder*** it is to remove an electron because the valence orbital is closer to the nucleus.





- Ionization energy ***decreases as atoms get larger*** because according to Coulomb's law the valence orbital is ***less attracted*** to the nucleus.