ELECTRON CONFIGURATION

O: $1s^2 2s^2 2p^4$

Shell and subshell

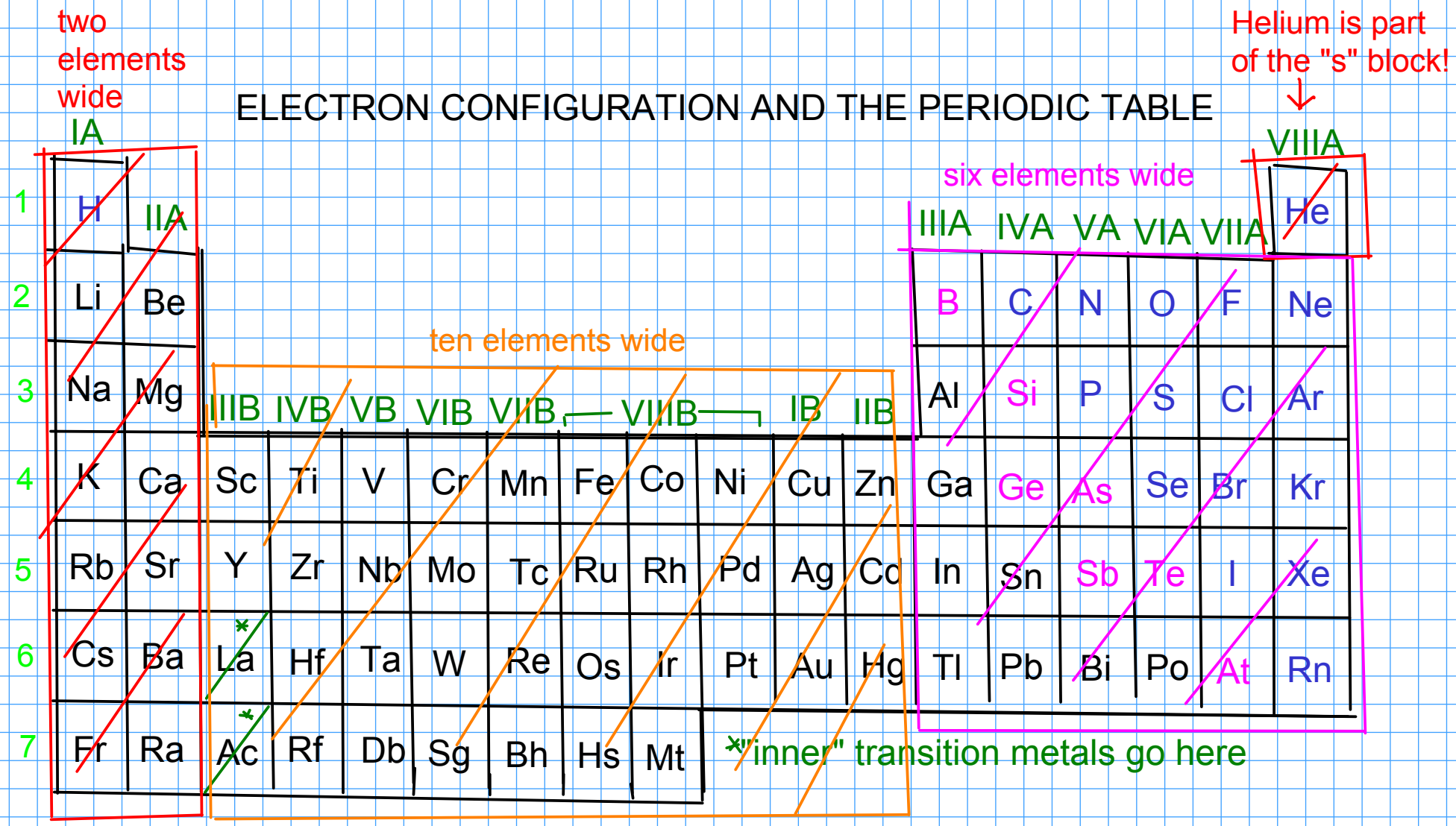
Number of electrons in the subshell!

Mg: $1s^2 2s^2 2p^6 3s^2$

Al: $1s^2 2s^2 2p^6 3s^2 3p^1$

Valence electrons are the ones in the outermost SHELL, not just the last subshell. Aluminum has THREE valence electrons.

ELECTRON CONFIGURATION AND THE PERIODIC TABLE

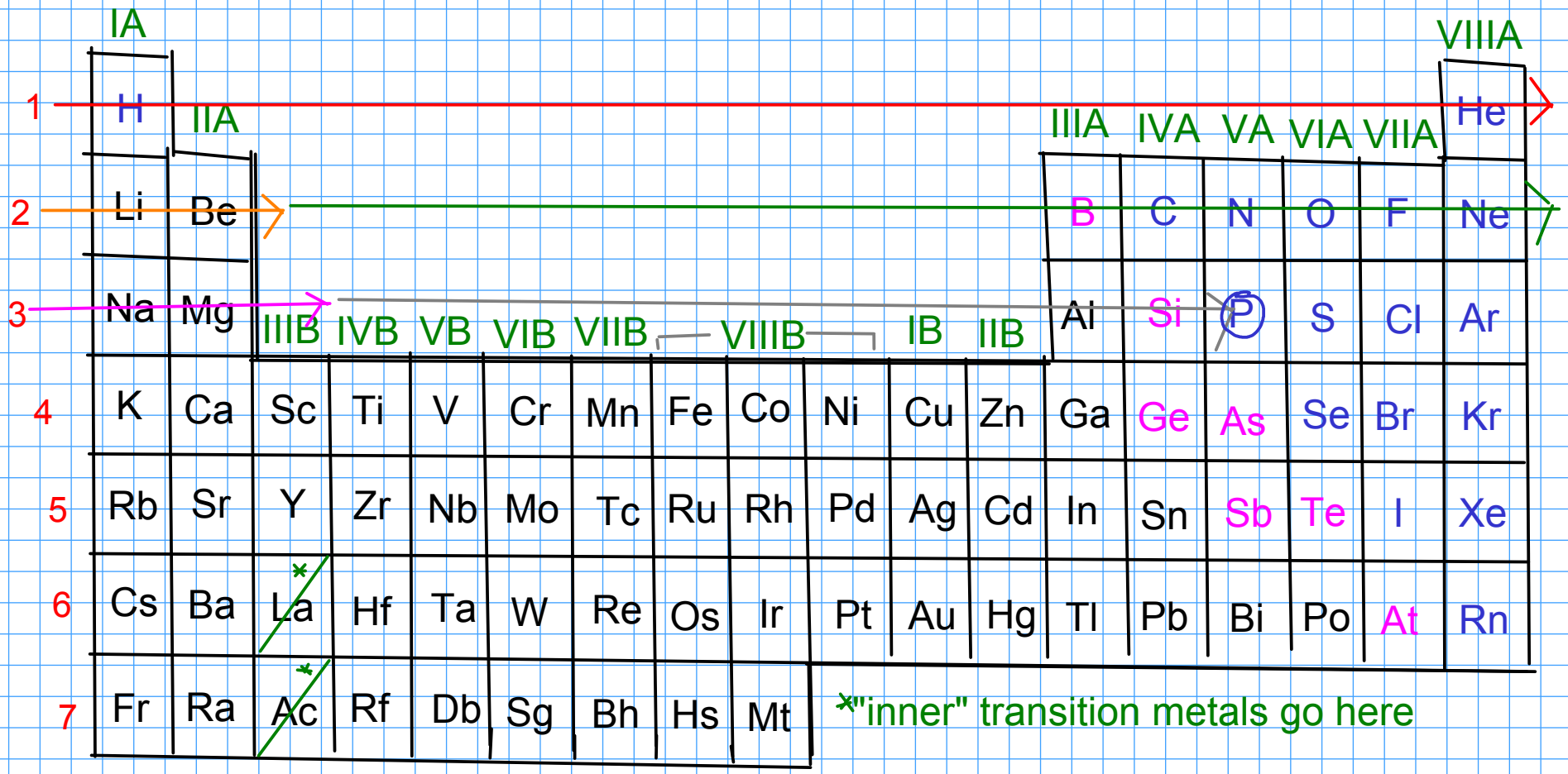


"s" block: last electron in these atoms is in an "s" orbital!

"p" block: last electron in these atoms is in a "p" orbital!

"d" block: last electron is these atoms is in a "d" orbital

- To write an electron configuration using the periodic table, start at hydrogen, and count up the electrons until you reach your element!



Example: Phosphorus (P): $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$

Phosphorus has FIVE valence electrons!

EXAMPLES:

F $1s^2 2s^2 2p^5$

Remember - valence electrons are ALL of the electrons in the outermost SHELL! (may have more than one SUBSHELL)!

S $1s^2 2s^2 2p^6 3s^2 3p^4$

Cl $1s^2 2s^2 2p^6 3s^2 3p^5$

$[Ne] 3s^2 3p^5$

TITANIUM is a transition metal that commonly forms either +2 or +4 cations. The 4s electrons are lost when the +2 ion forms, while the 4s AND 3d electrons are lost to form the +4!

You can order the subshells in numeric order OR in filling order

Ti $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^2$ or $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$

or $[Ar] 3d^2 4s^2$

Se $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^4$

or $[Ar] 3d^{10} 4s^2 4p^4$

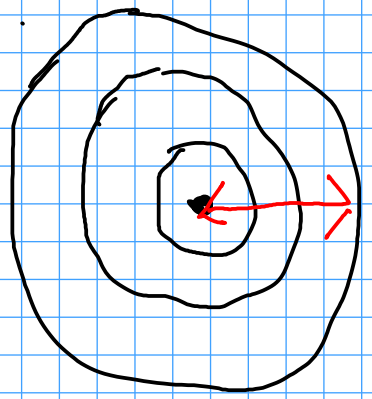
Noble gas core notation. Use the previous noble gas on the table, then add the electrons that it doesn't have to the end.

Kr $[Ar] 3d^{10} 4s^2 4p^6$

PERIODIC TRENDS

- Some properties of elements can be related to their positions on the periodic table.

ATOMIC RADIUS



- The distance between the nucleus of the atoms and the outermost shell of the electron cloud.

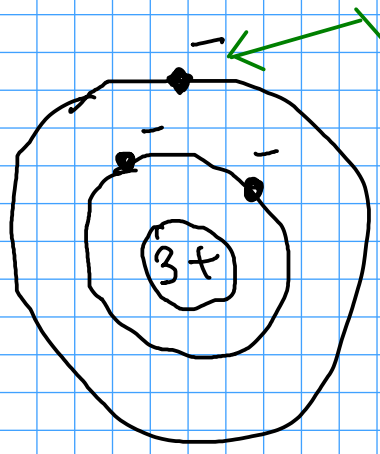
- Relates to the size of the atom.

- As you go DOWN A GROUP (↓), the atomic radius INCREASES.

- Why? As you go down a period, you are ADDING SHELLS!

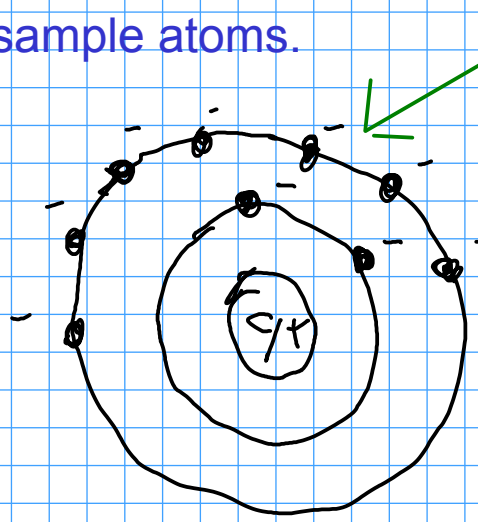
- As you go ACROSS A PERIOD (→), the atomic radius DECREASES

Why? Let's look at some sample atoms.



Outer electron sees an effective +1 charge (shielded from +3 nucleus by 2 electrons)

lithium



Outer electrons see an effective +7 charge (shielded from +9 nucleus by 2 electrons)

fluorine

... so fluorine's outer shell is pulled closer to the nucleus than lithium's!

IONIZATION ENERGY (or FIRST IONIZATION ENERGY)

- The amount of energy required to remove a single electron from the outer shell of an atom.

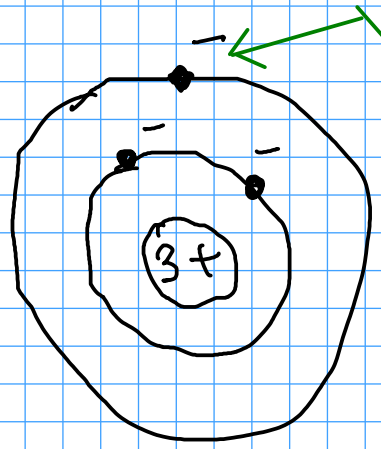
- Relates to reactivity for metals. The easier it is to remove an electron, the more reactive the metal.

- As you go DOWN A GROUP (↓), the ionization ebergy DECREASES.

  - Why? As you go down a period, you are ADDING SHELLS. Since the outer electrons are farther friom the nucleus and charge attraction lessens with distance, this makes electrons easier to remove as the atoms get bigger!

- As you go ACROSS A PERIOD (→), the ionization energy INCREASES.

  - Why? Let's look at some sample atoms.



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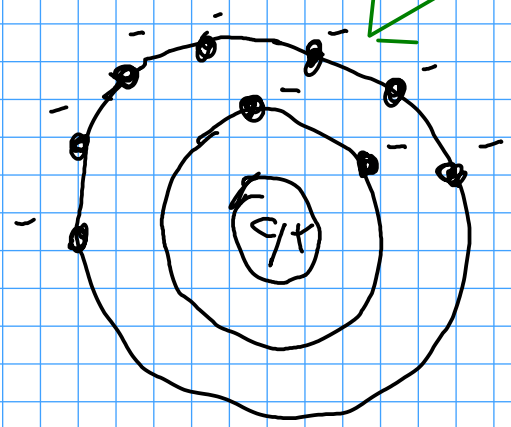

Outer electrons see an effective +7 charge (shielded from +9 nucleus by 2 electrons)

fluorine

... since fluorine's outer electrons are held on by a larger effective charge, they are more difficult to remove than lithium's.