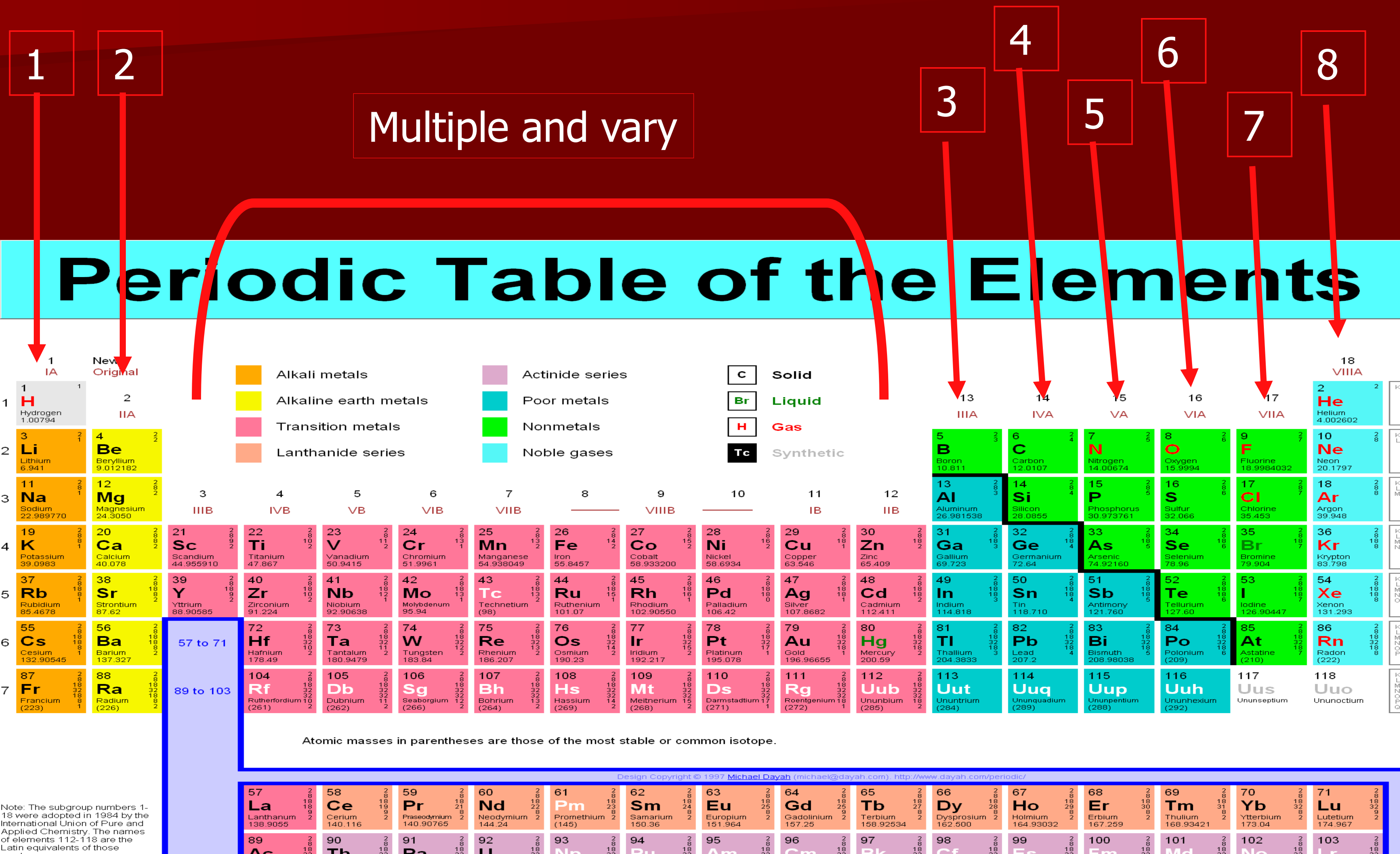
Periodic Trends

Schweitzer

How many valence electrons?

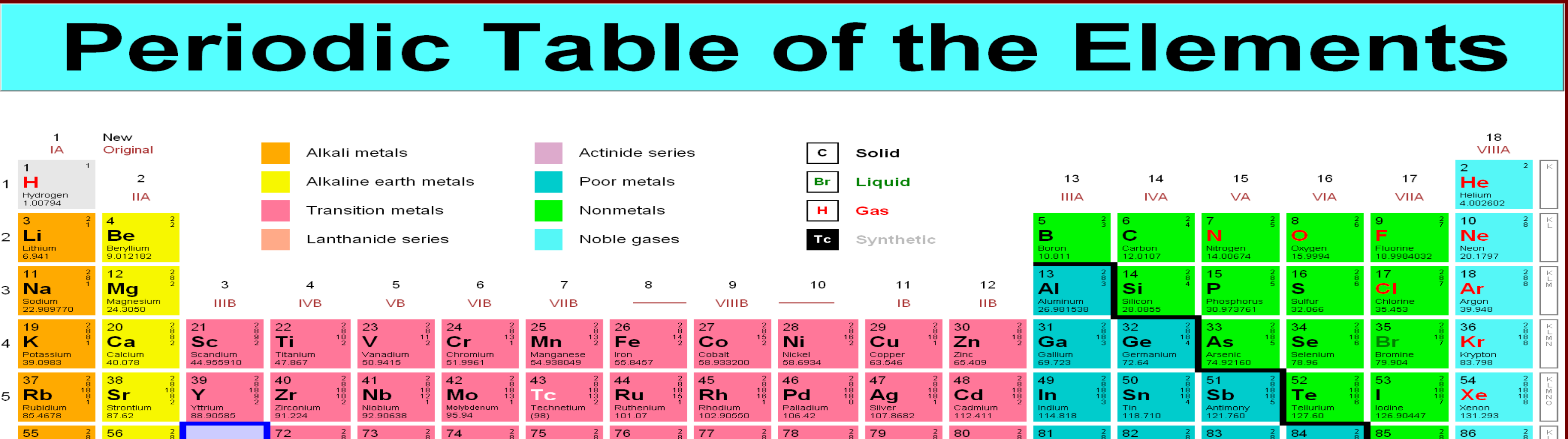


Octet Rule!

- All atoms are trying to obtain the octet rule. This means they will gain or lose electrons to achieve this octet.

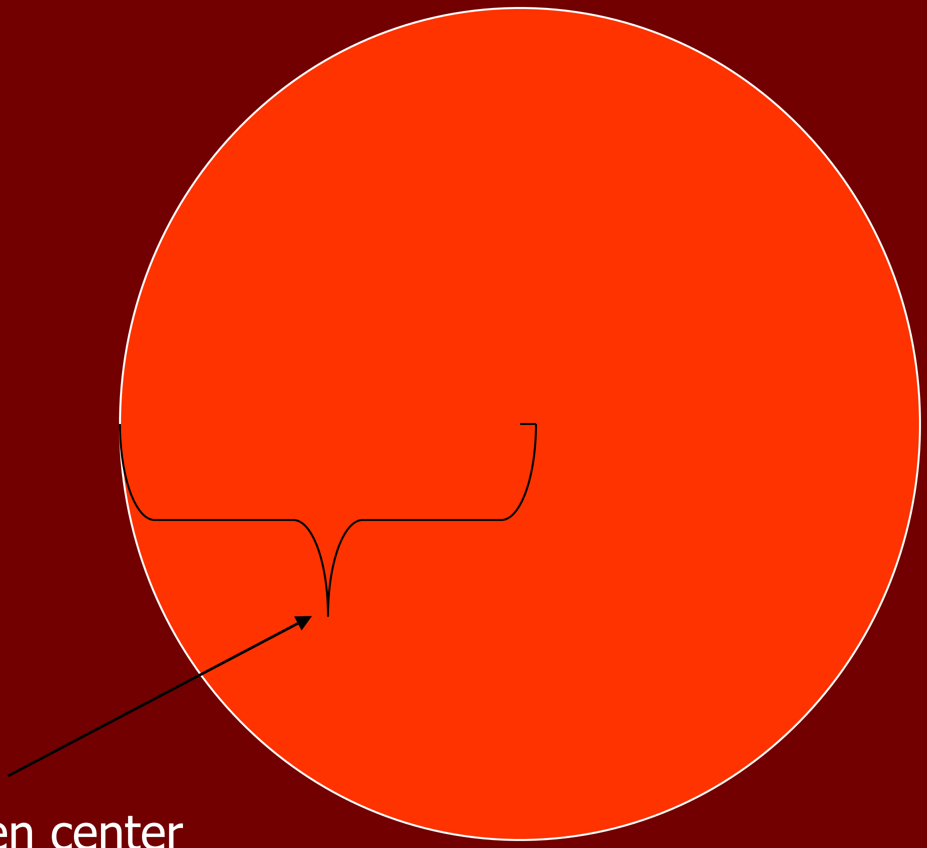
Lose ← → Gain

1 2 Varies 1-5 3 4 5 6 7 8



Atomic Radius

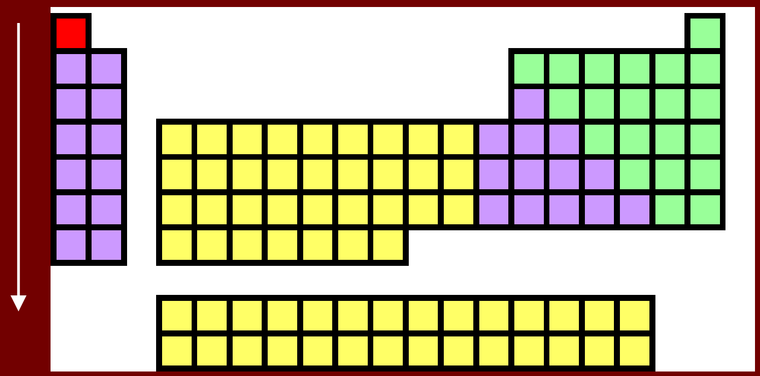
- Define Radius



Distance between center
and outer edge

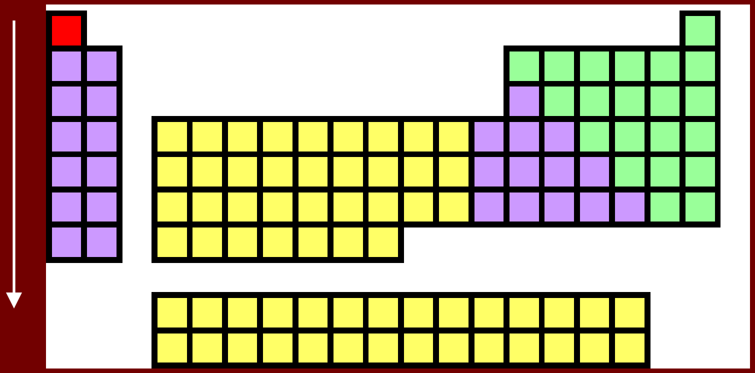
Atomic radius

- What happens as you move down the periodic table?

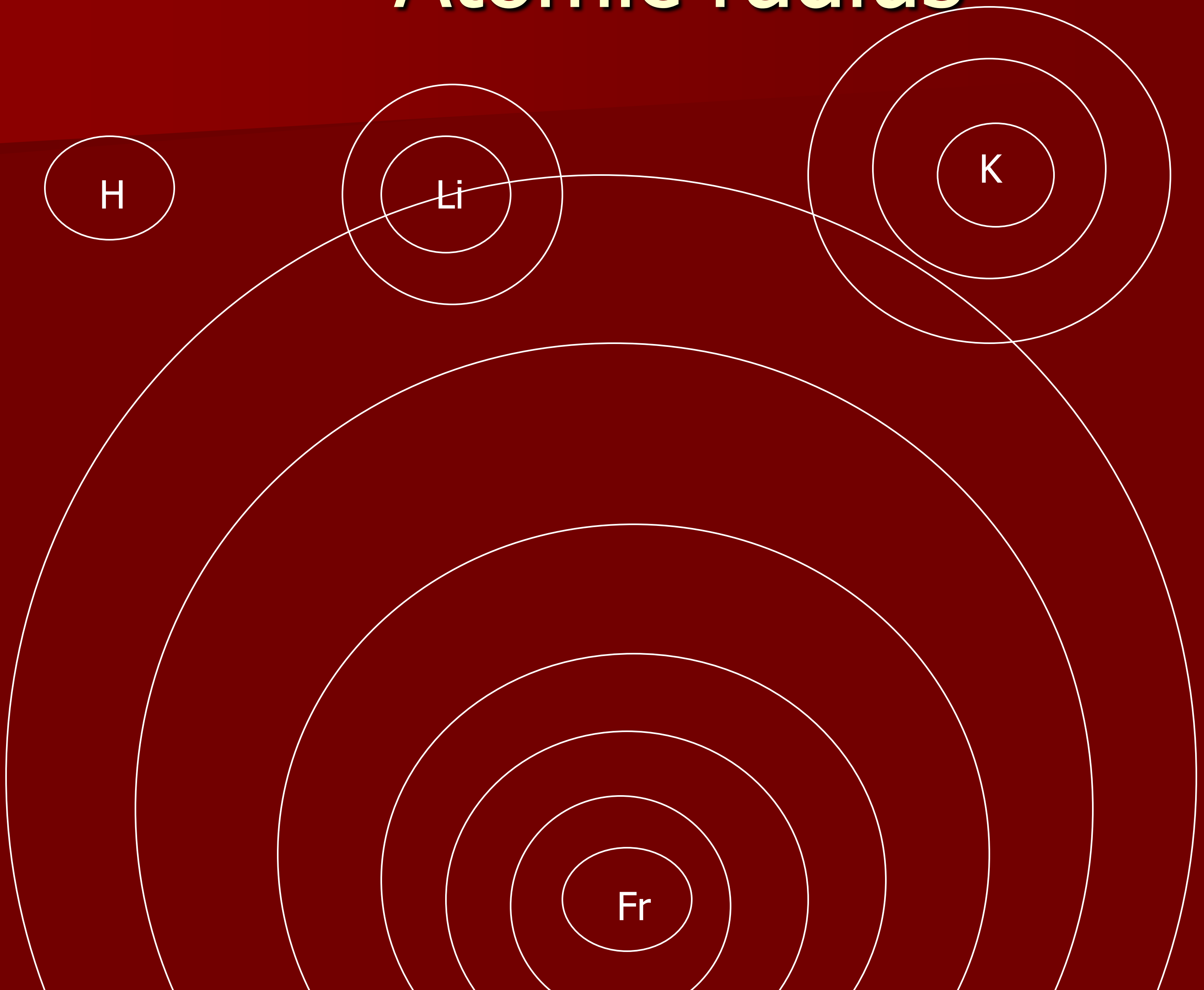


Atomic radius

- Every time you drop to a new row on the periodic table you add another energy level. So the size gets a lot bigger.

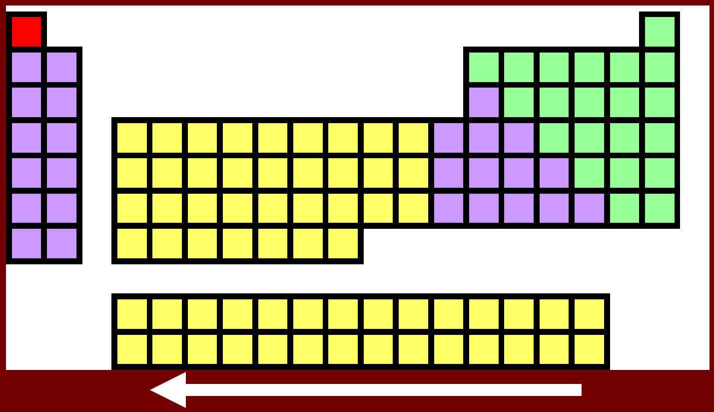


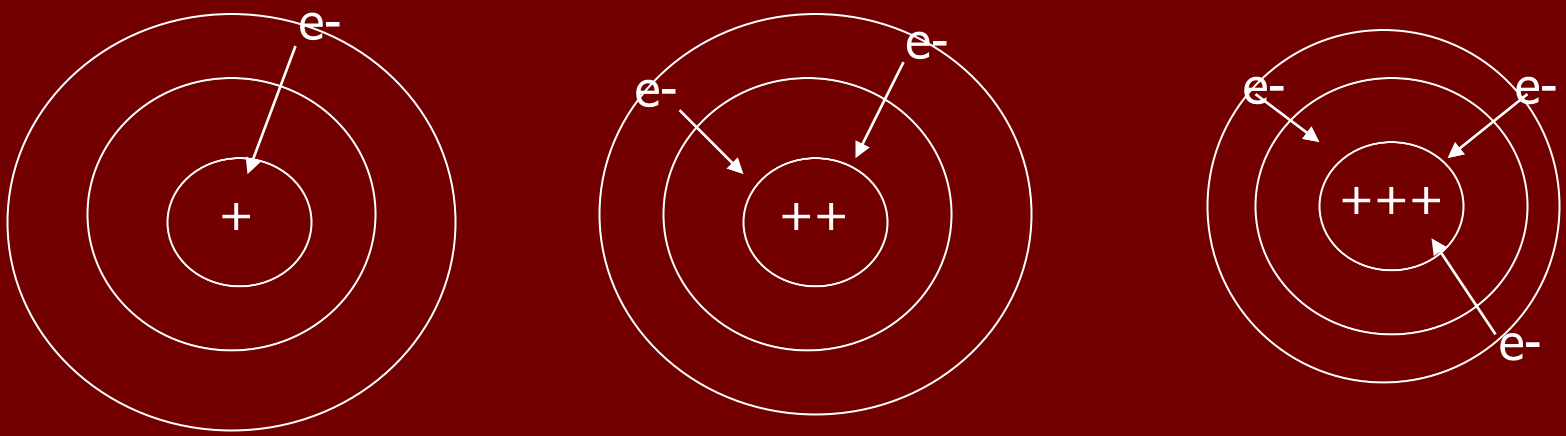
Atomic radius



Atomic radius
With in a period?

- As you add electrons with in a row the attraction increases pulling in the outer electrons reducing the atomic radius slightly





Atomic radius
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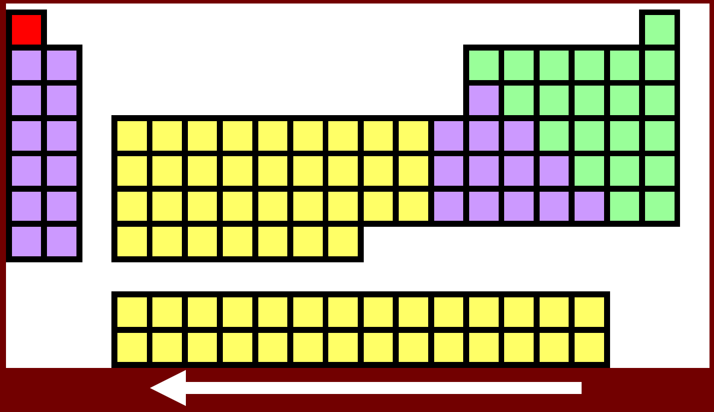
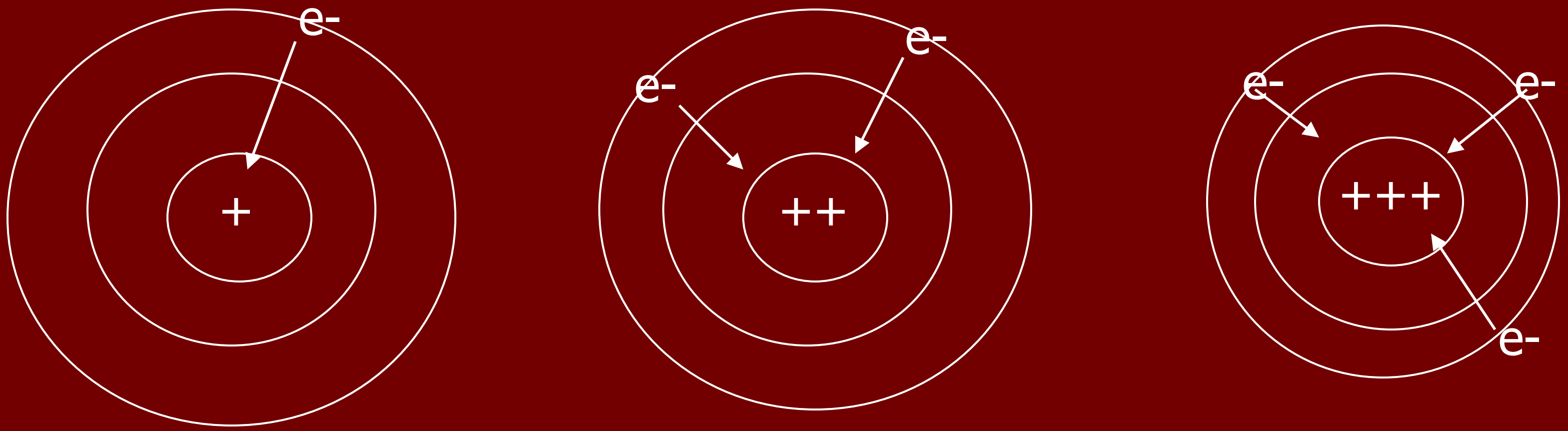
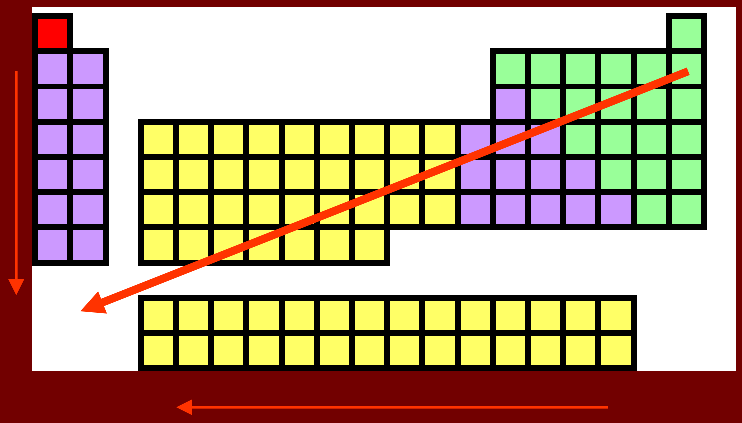




What do you think is the BIGGEST atom on the periodic table?

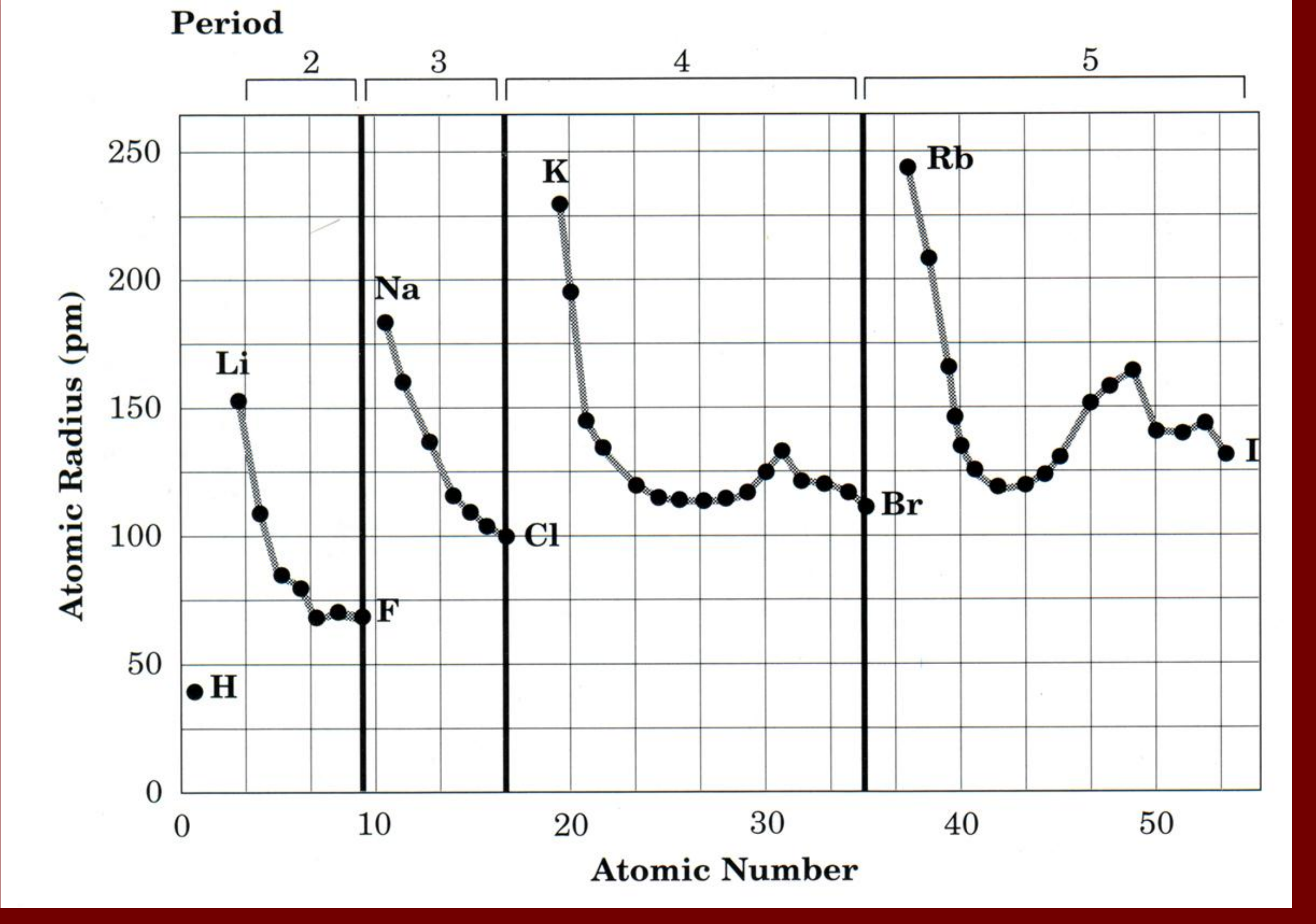
Atomic radius

- Increases as you go down
- Increases as you to to the left
- Therefore the biggest atoms are in the lower left and the smallest are in the upper right
- Hydrogen is the smallest. (exception)

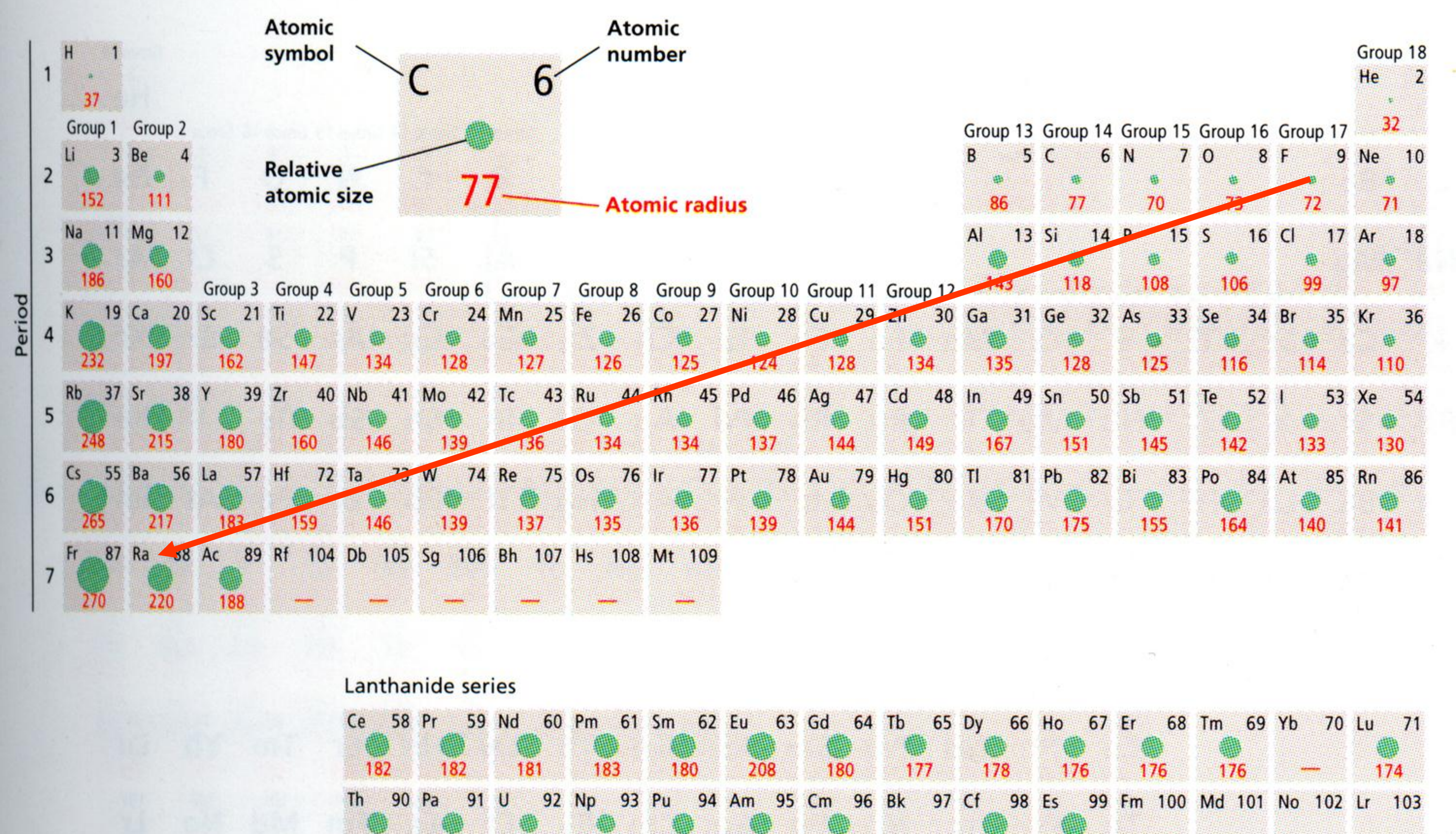


Atomic radius energy

- graph



Atomic radius



Reactivity

- The easier electrons are gained or lost the more reactive.

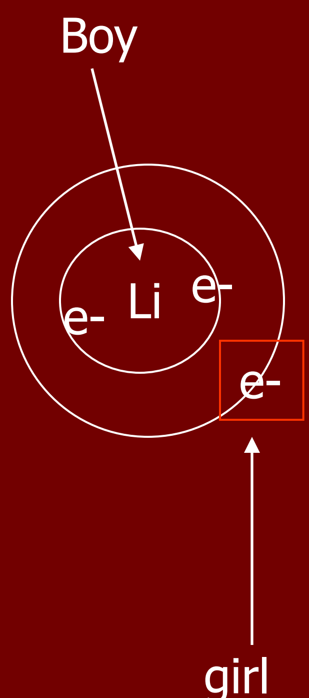
$$Li \longrightarrow Li^{+}$$

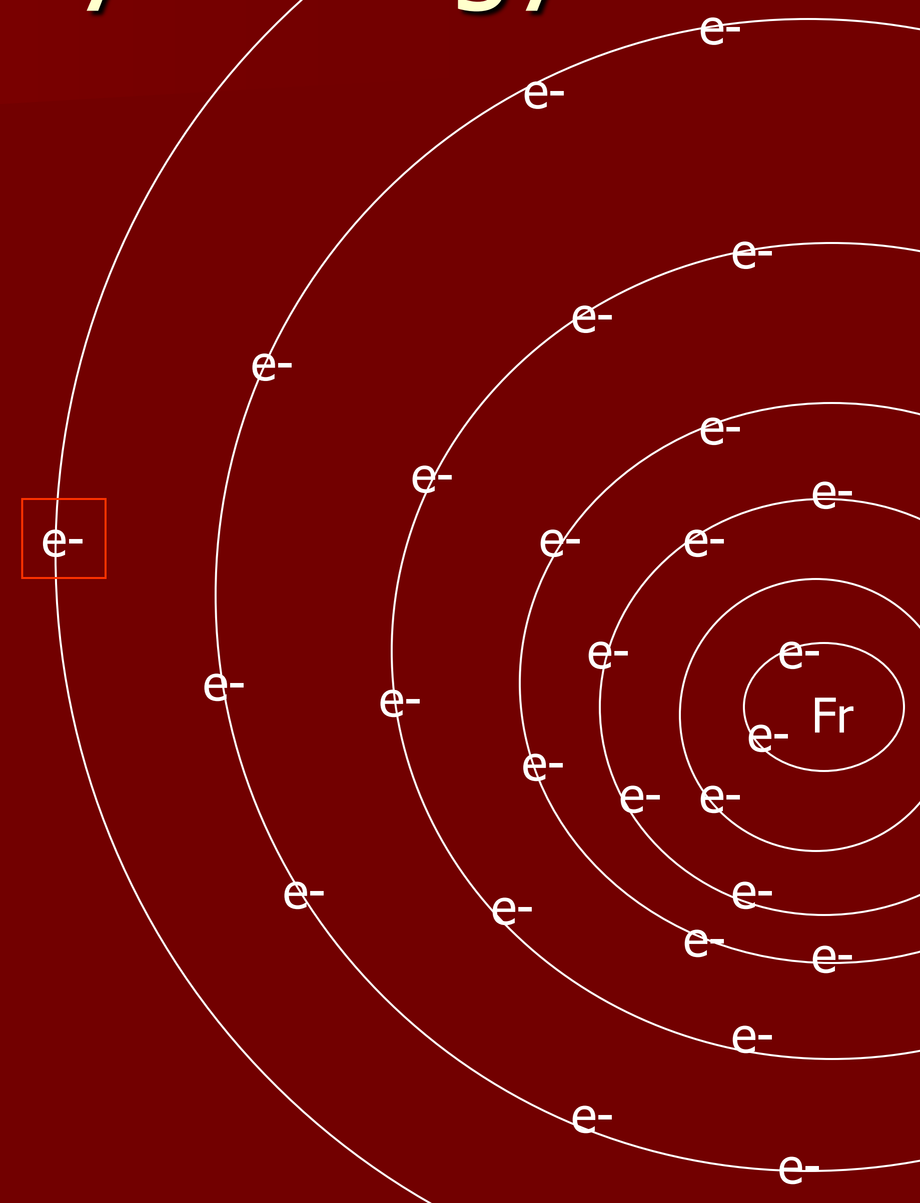
- First Metals like to lose electrons.
- Trying to attain a full outer shell.
- Non-metals are gaining electrons

$$F \longrightarrow F^{-}$$

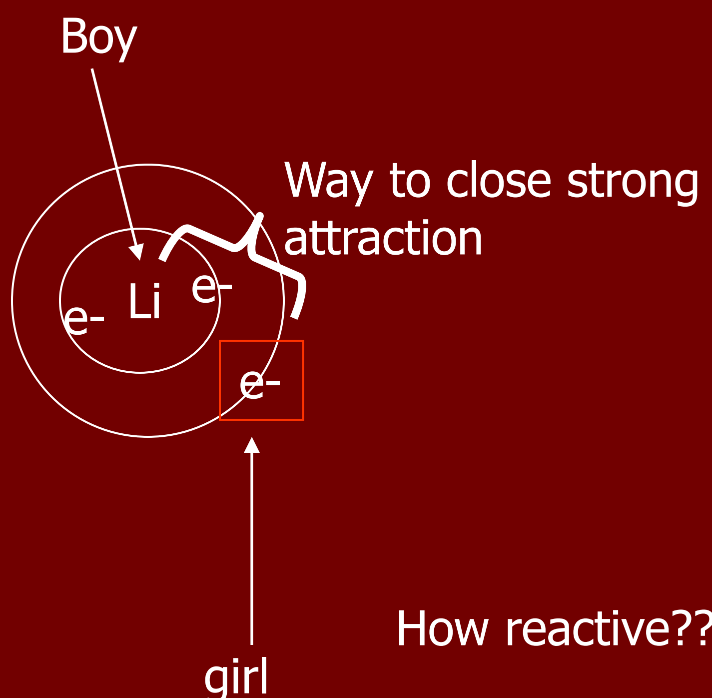
Metal reactivity analogy

- sd

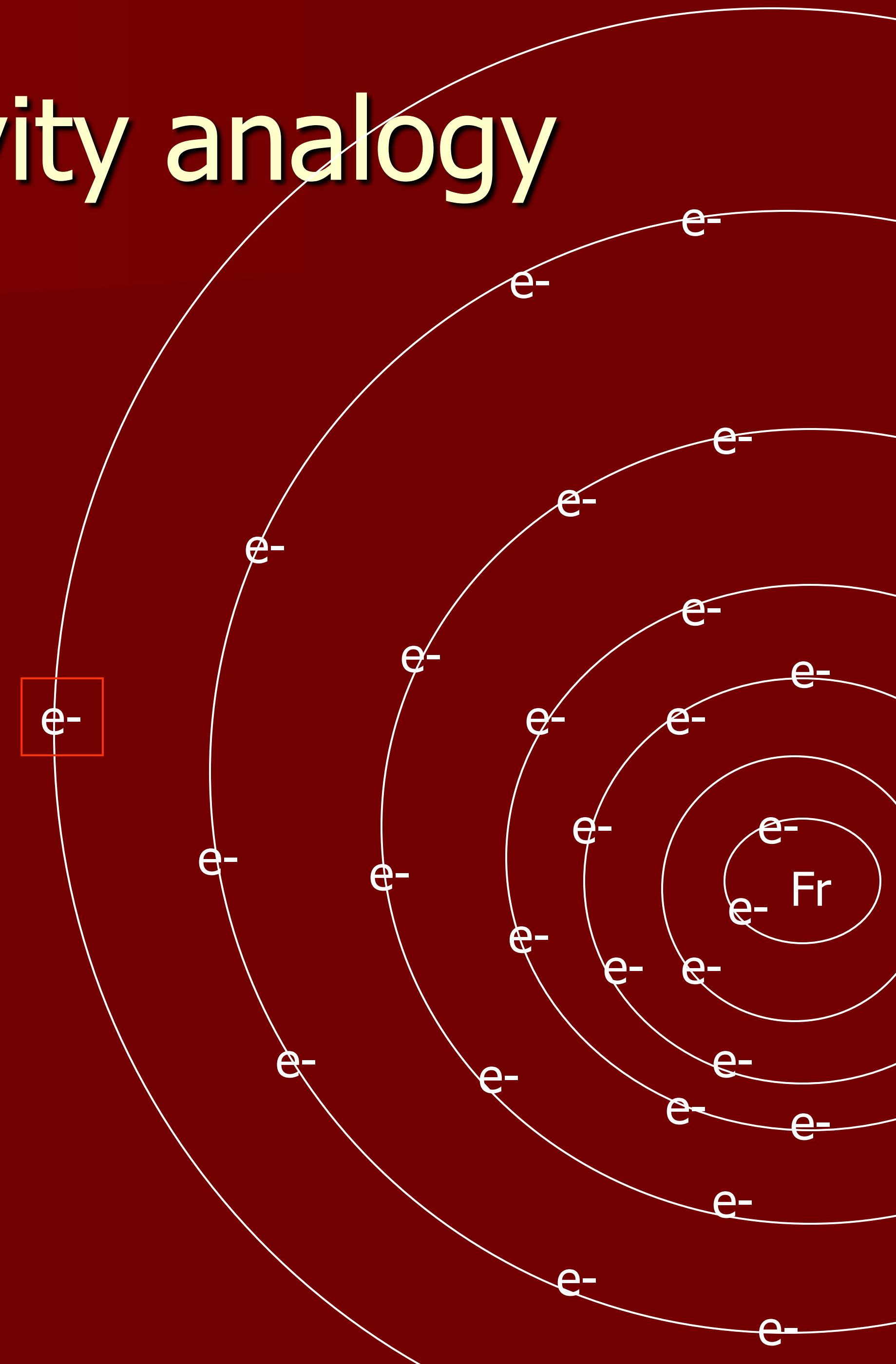




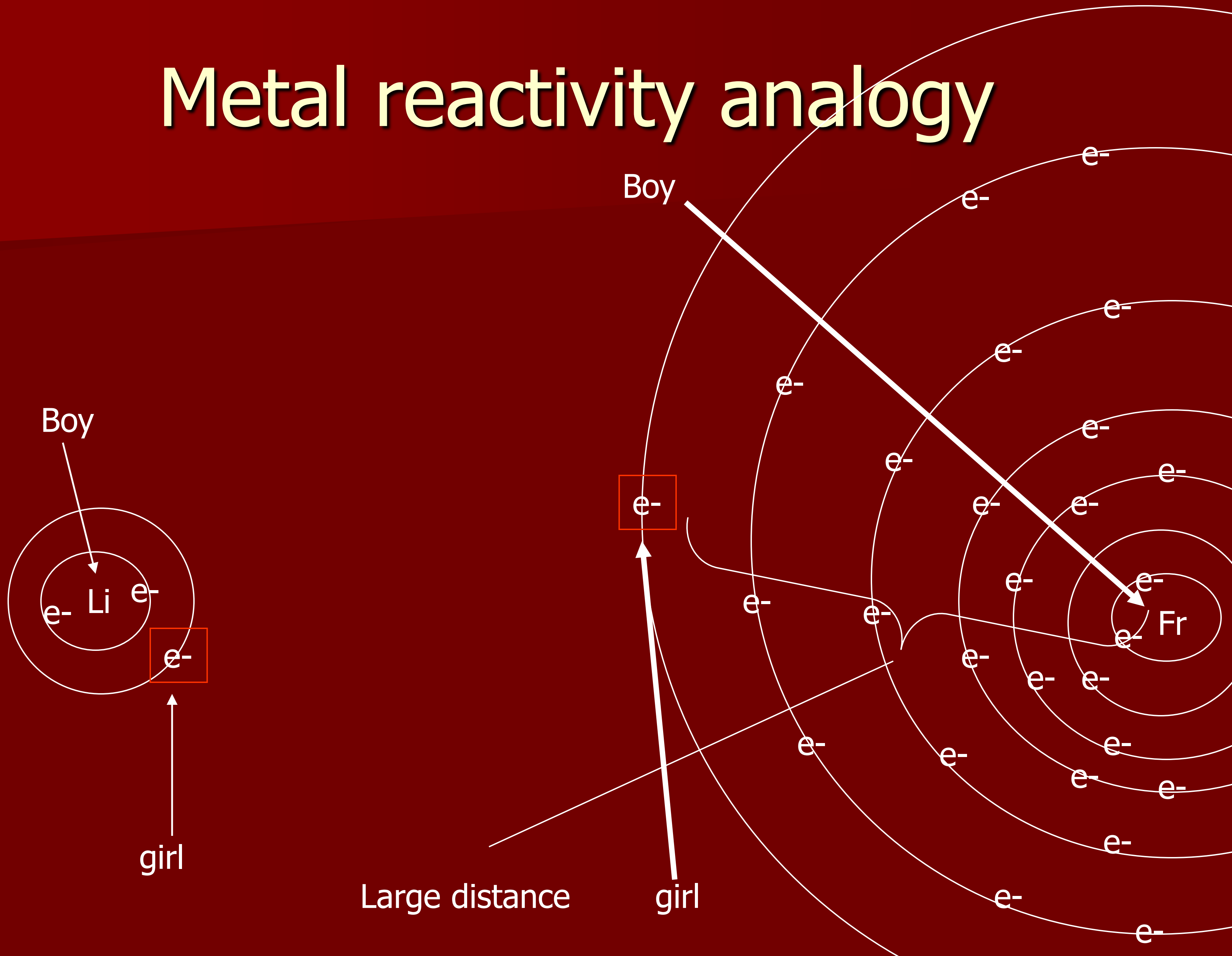
Metal reactivity analogy



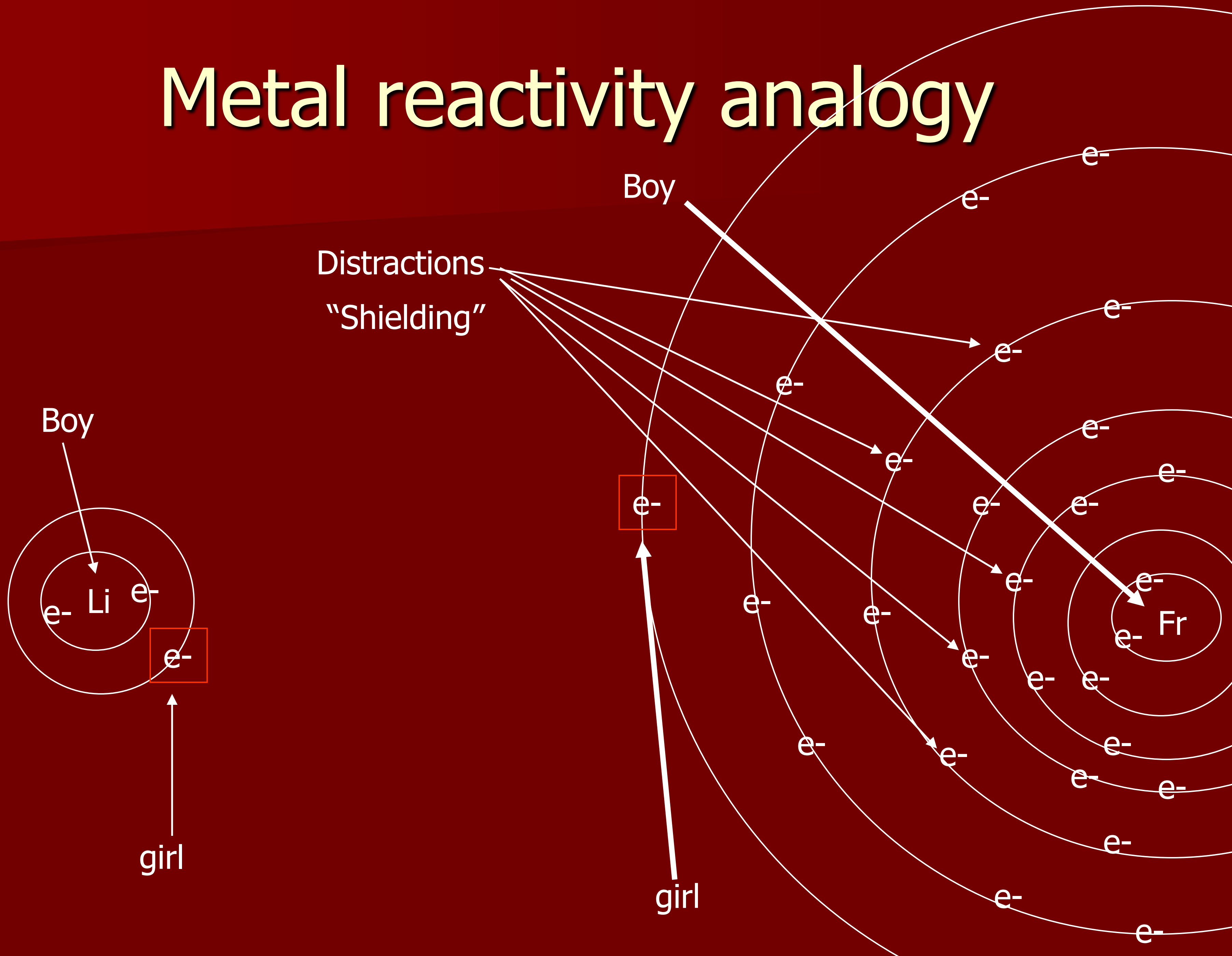
How reactive???



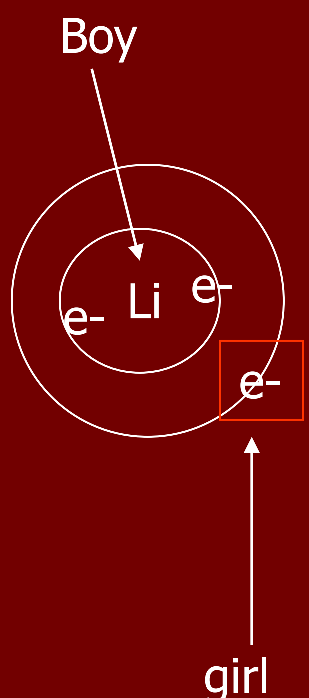
Metal reactivity analogy



Metal reactivity analogy

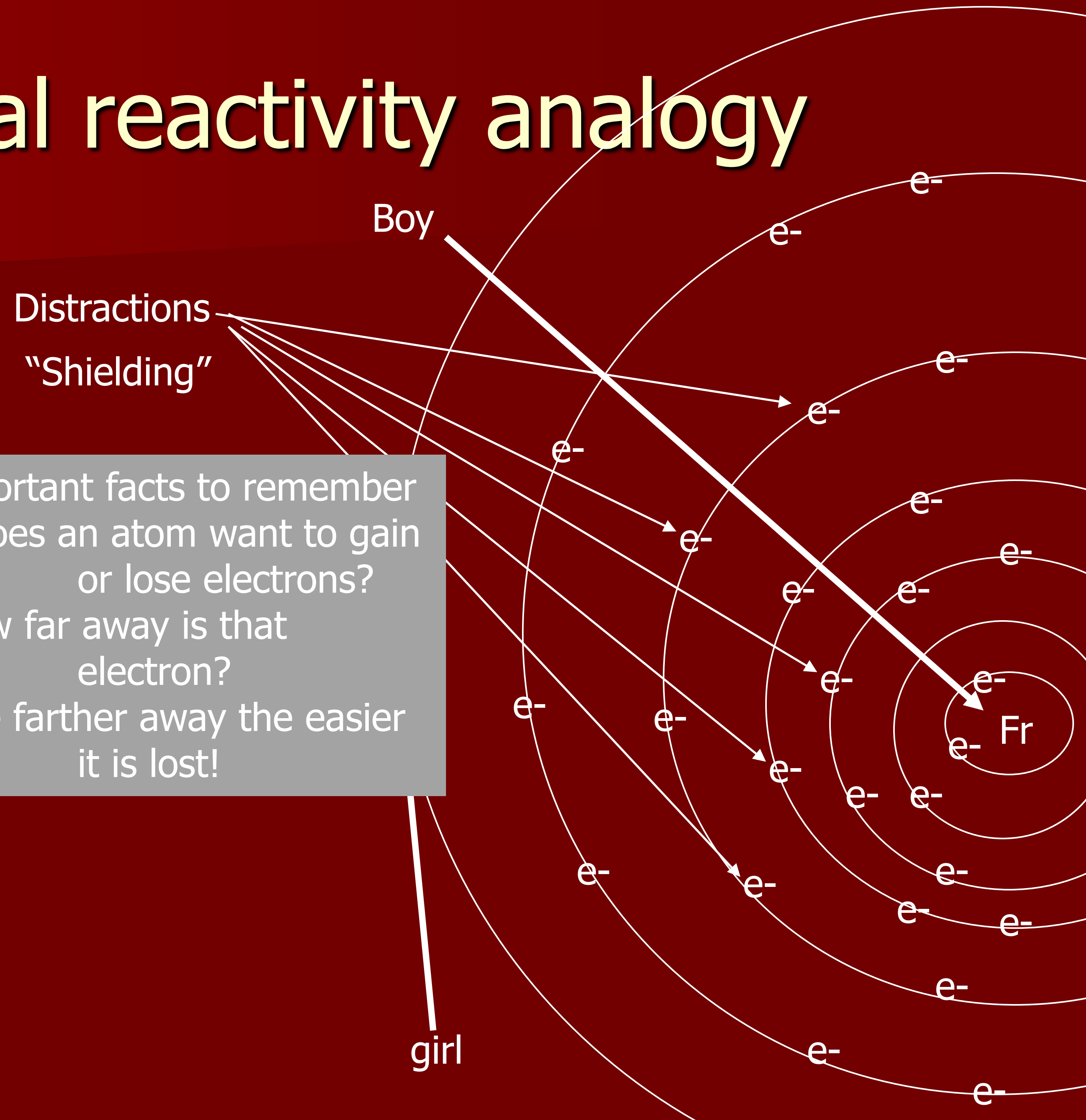


Metal reactivity analogy



Important facts to remember

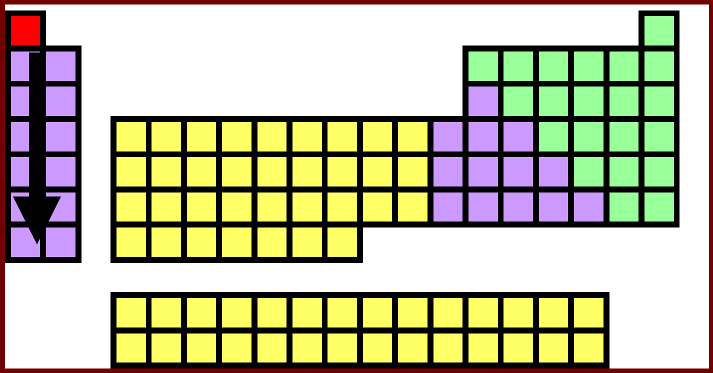
- Does an atom want to gain or lose electrons?
- How far away is that electron?
- The farther away the easier it is lost!



Reactivity of metals

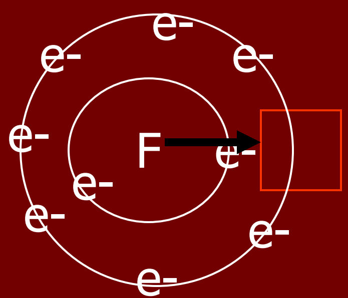
First, Metals want to lose electrons.

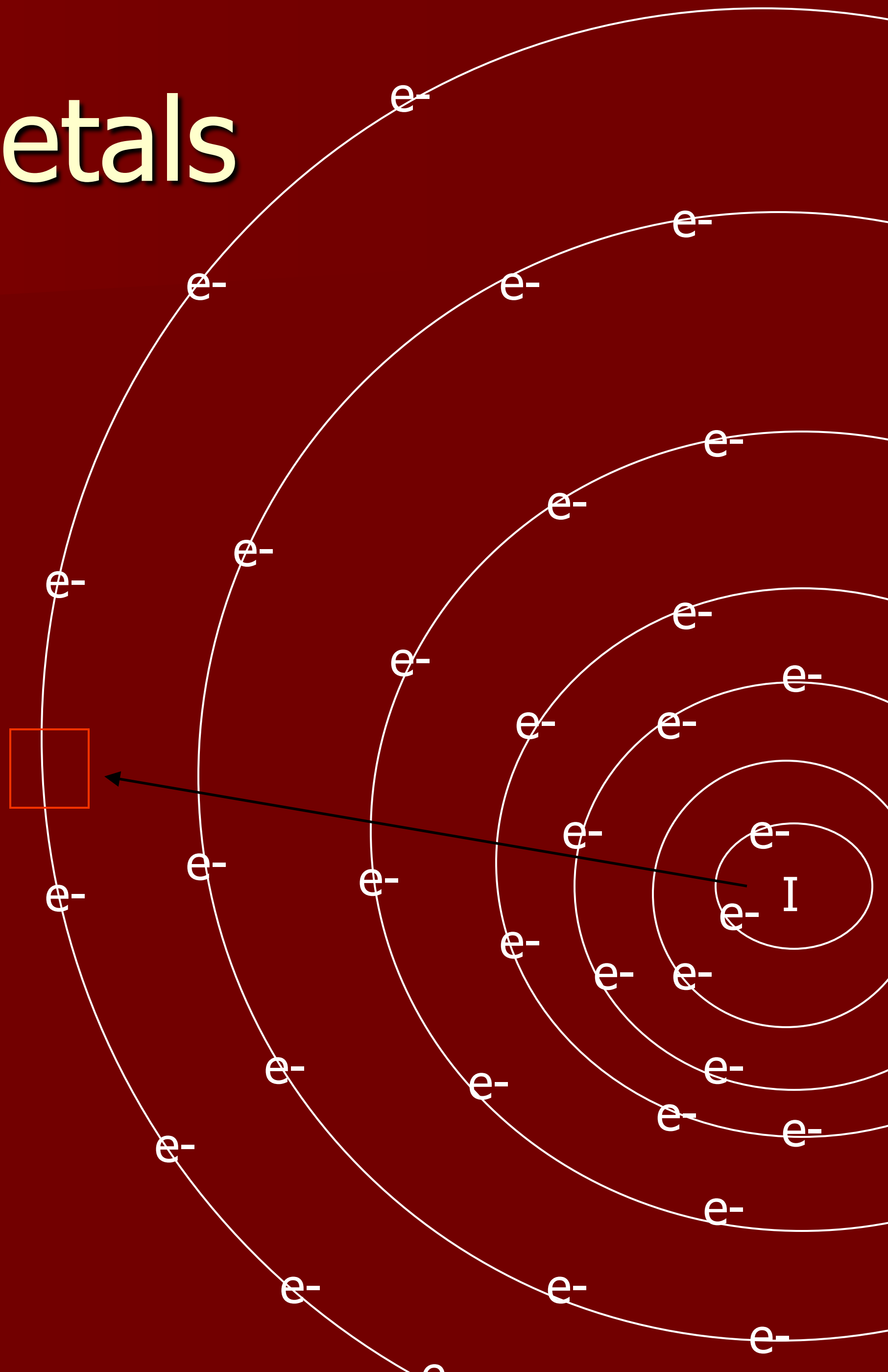
Therefore, the farther away the electron is the easier it is to lose and the more reactive it is.



Non-metals

- The Biggest difference between metals and non-metals is that metals will be gaining electrons

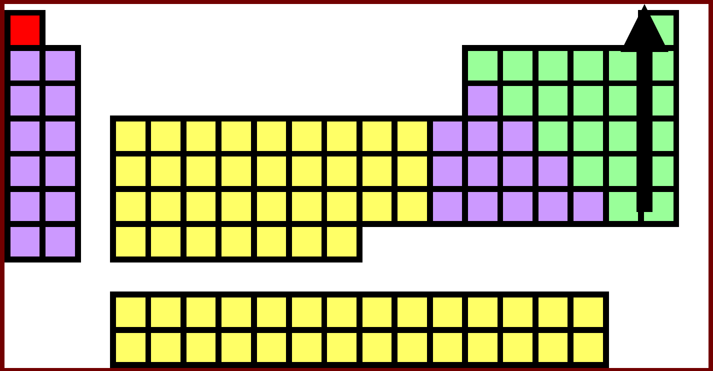




Reactivity of non-metals

First, non-metals want to gain electrons.

Therefore, the closer the electron is the easier it is to gain and the more reactive it is.

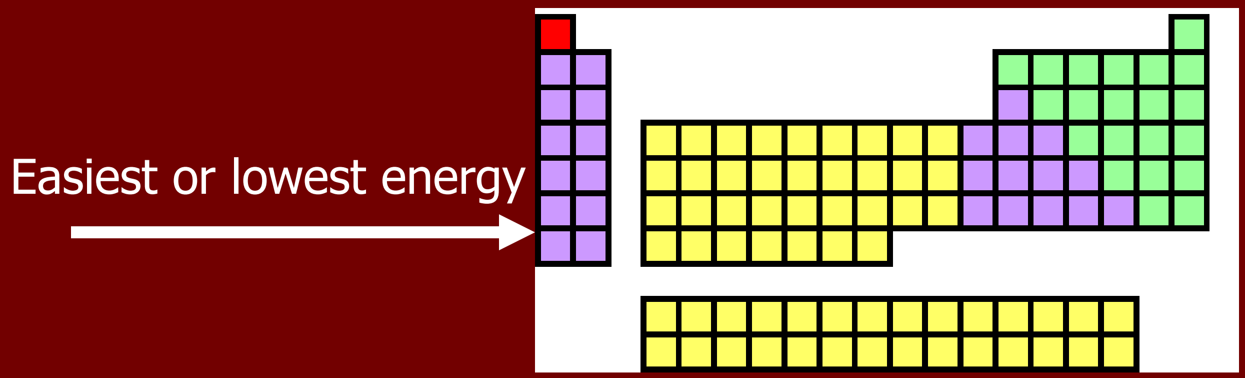


Ionization Energy

- Amount of energy needed to remove an electron.
- Amount of energy needed to remove succeeding electrons always requires more energy.
  - Pulling a negative away from a positive is more difficult.

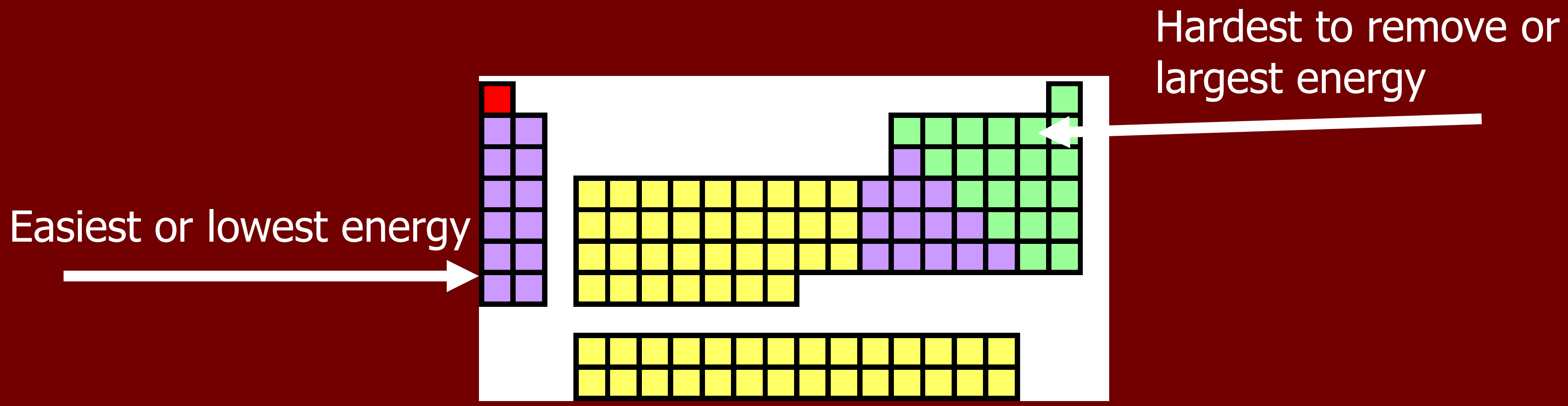
Ionization Energy

- With what we know about reactivity what electrons would be easiest to remove.
- Atoms that want to lose electron any ways
  - Metals
- Atoms where those electrons are the farthest away.



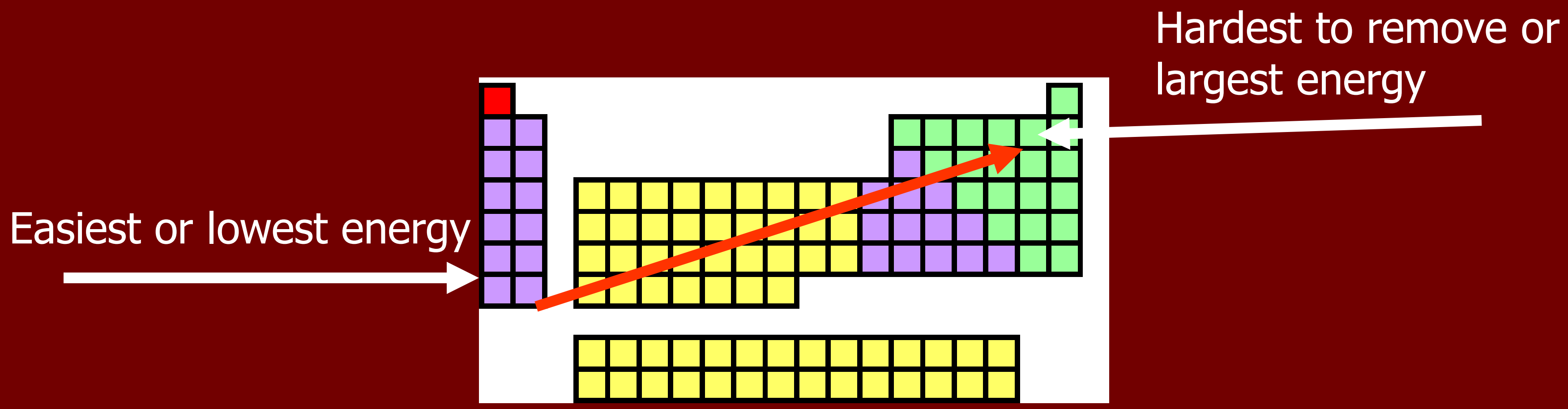
Ionization Energy

- With what we know about reactivity what electrons would be Hardest to remove.
- Atoms that want to gain electrons any ways
  - Non-Metals
- Atoms where those electrons are the closest.

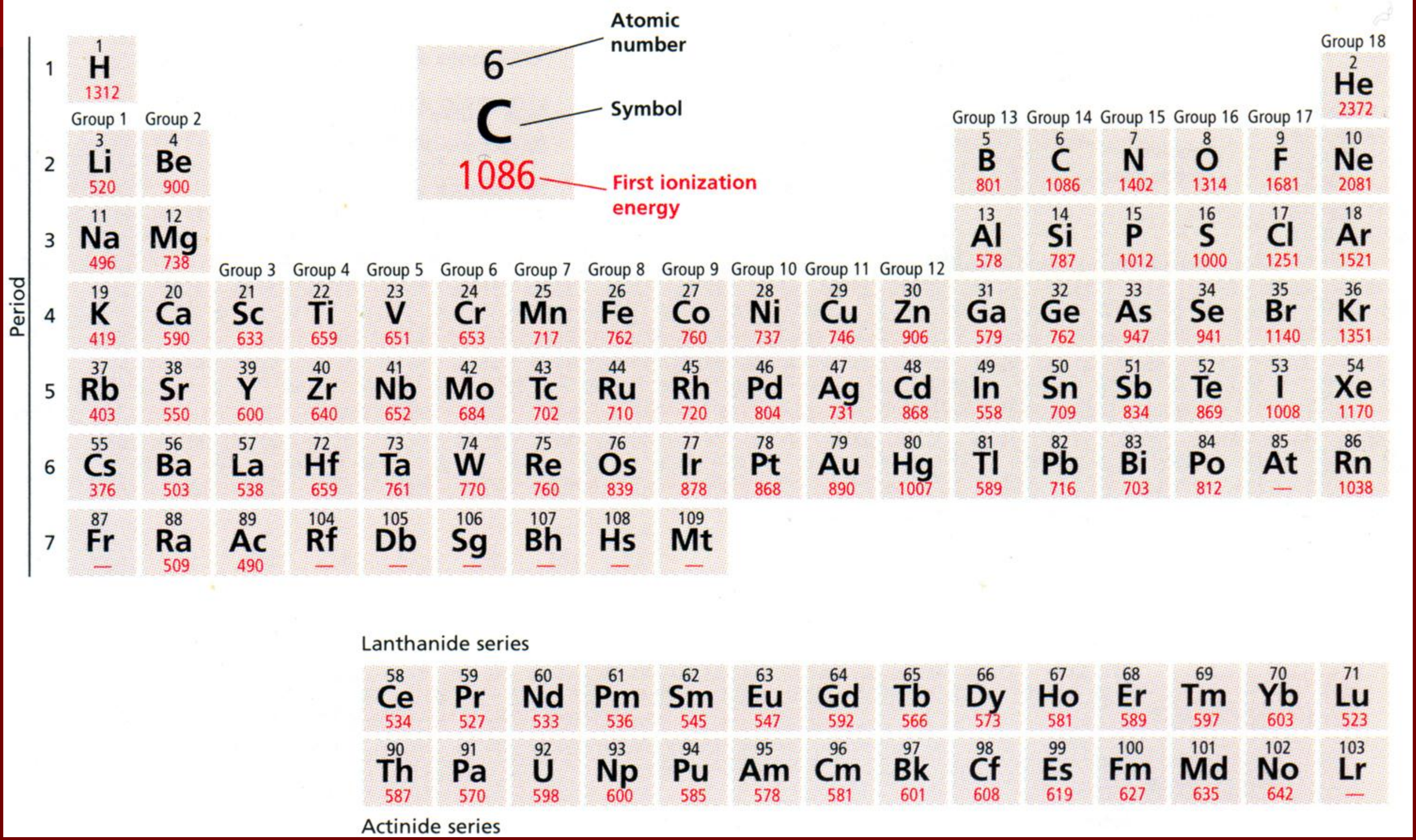


Ionization energy

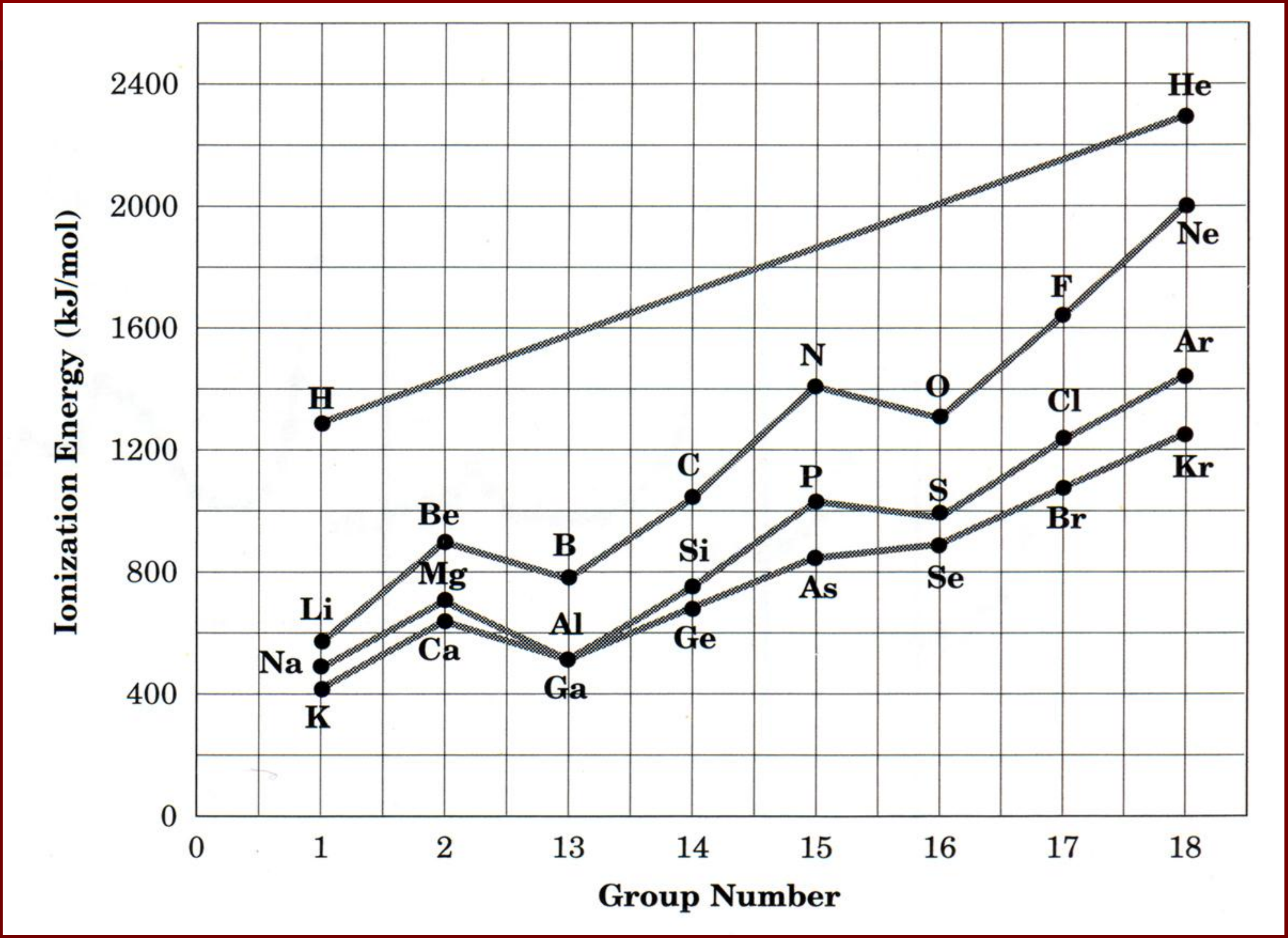
- What is the trend?



First Ionization energy

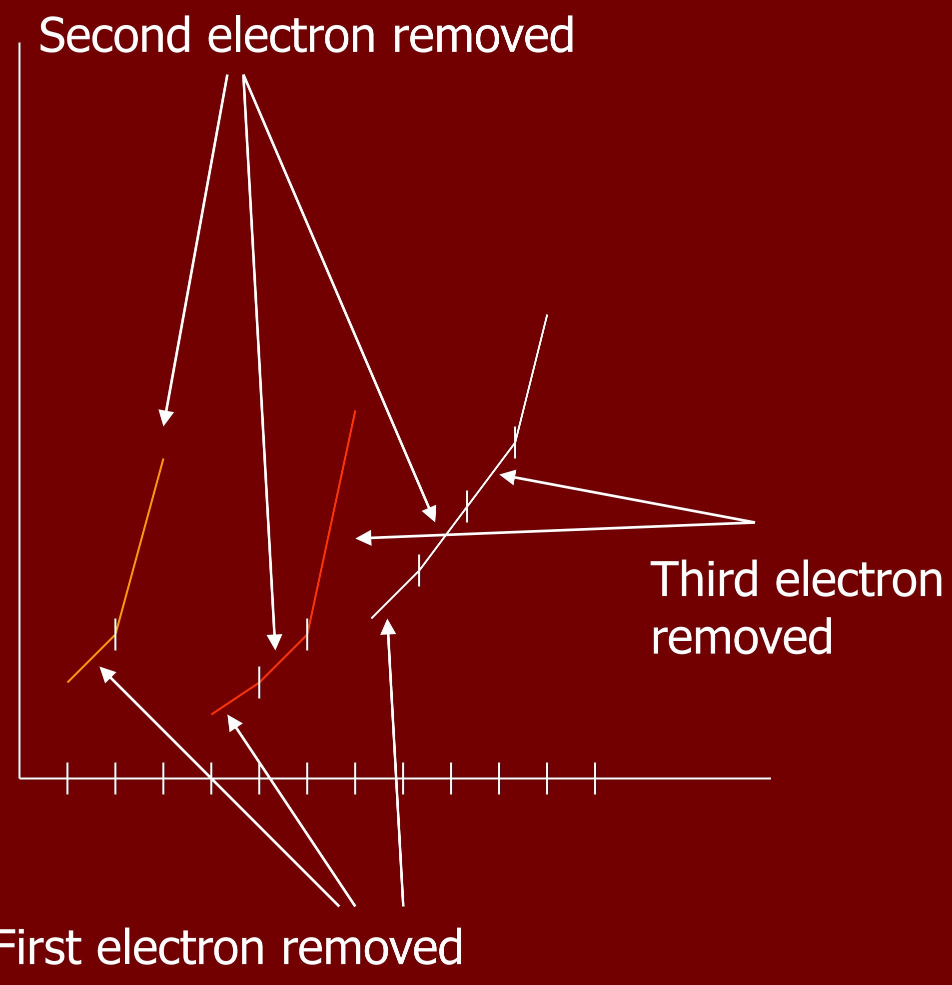


Ionization energy graph



Removing succeeding electrons

- First electrons are always the easiest electrons to remove.
- Why did the ionization energy spike at different times?



Removing succeeding electrons

- Na: 1 Valence electron
- Mg: 2 Valence electrons
- Al: 3 Valence electrons

- After clearing out a shell it is very difficult to break into a full shell.