THE PERIODIC TABLE & TRENDS

UNIT LEARNING GOAL

Throughout this unit we will be working on **ALL** of our learning goals.

Our learning goal with respect to **understanding concepts** is:

We are learning to describe the periodic trends in the periodic table, and how elements combine to form chemical bonds.

TO SUPPORT THIS GOAL TODAY'S LEARNING GOALS ARE…

- We are learning to **explain** how the patterns in the electron arrangement and forces in atoms **result in periodic trends** in the periodic table **(understanding concepts).**
- We are learning how to use scientific terminology to explain these trends **(communication).**

ELECTRON AFFINITY

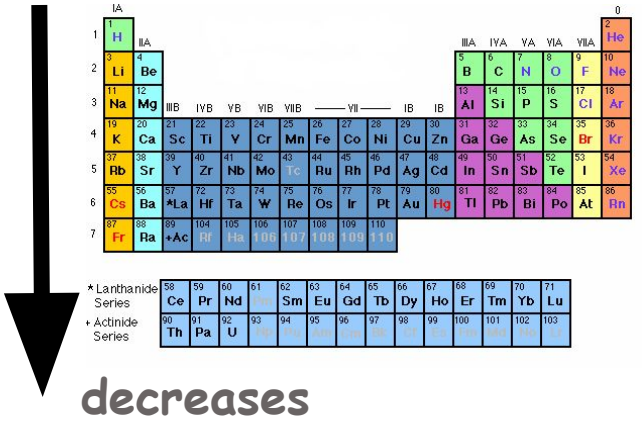
- The ability of an atom to attract an electron.

- measured as an **“energy change"** when an electron is added to the **outer** energy level to form a negative ion (ANION)

- The more negative the electron affinity value, the higher an atom's affinity for electrons.

ELECTRON AFFINITY TREND

Top to Bottom: E.A. decreases

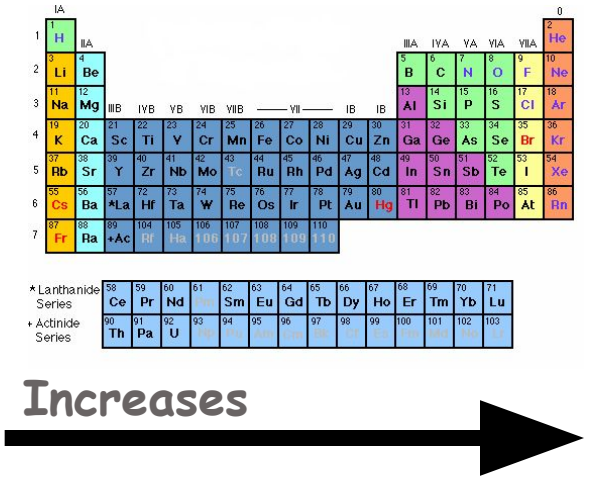


- **WHY?????**

- Each atom is larger than the atom above it an added electron is further away from the atom's nucleus compared with its position in the smaller atom.
- With a larger distance between the negatively-charged electron and the positively-charged nucleus, the force of attraction is relatively weaker.
- Therefore, electron affinity decreases.

ELECTRON AFFINITY TREND

- **Left to Right: E.A. increases**



- **WHY?????**

- Effective nuclear charge increases = smaller atomic radius = greater attraction for electrons

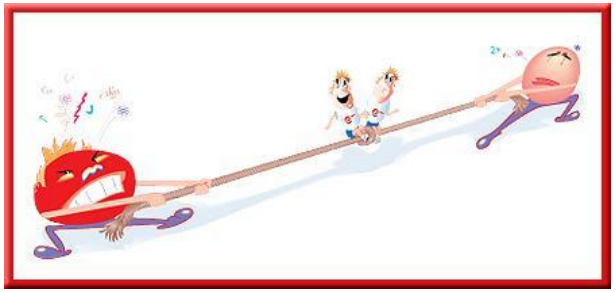
- Halogens have most valence e's; they want to GAIN electrons

- Thus halogens have highest E.A.

- So far, we have looked at trends directed towards individual atoms of elements.

- Let's now look at how these atoms behave when they form bonds…

ELECTRONEGATIVITY:



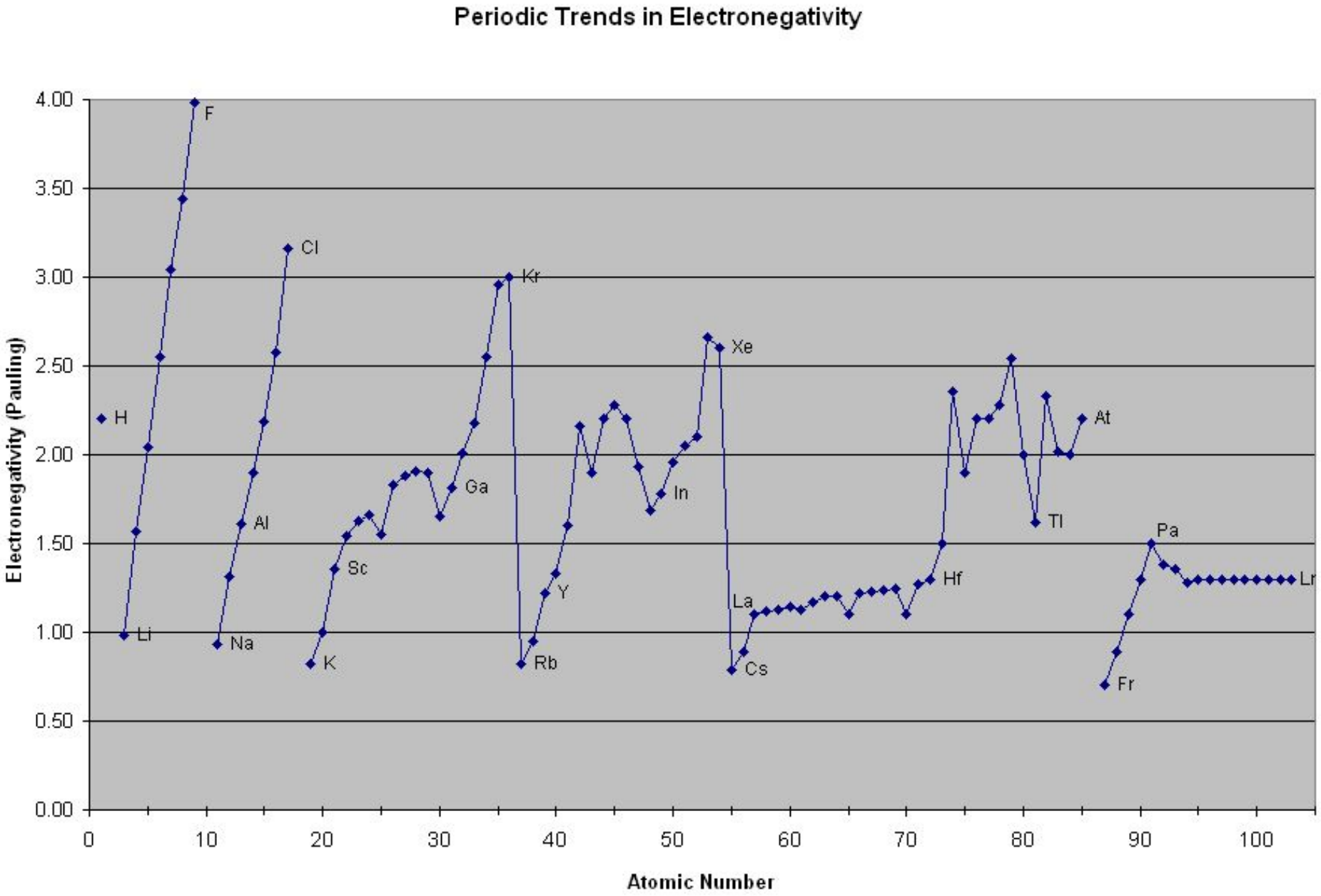
- The relative ability of a bonded atom to attract shared electrons to itself.
- Atoms with relatively high electronegativities (EN) tend to pull bonded electrons closer to their nuclei.
- This dictates the nature of the bonds that form and the properties of the compounds containing those bonds.
- Electronegativity affects **BONDED** atoms (2 or more)

- Smaller atoms have higher EN values since their nuclei would be closer to bonded electrons than the nuclei of larger atoms.

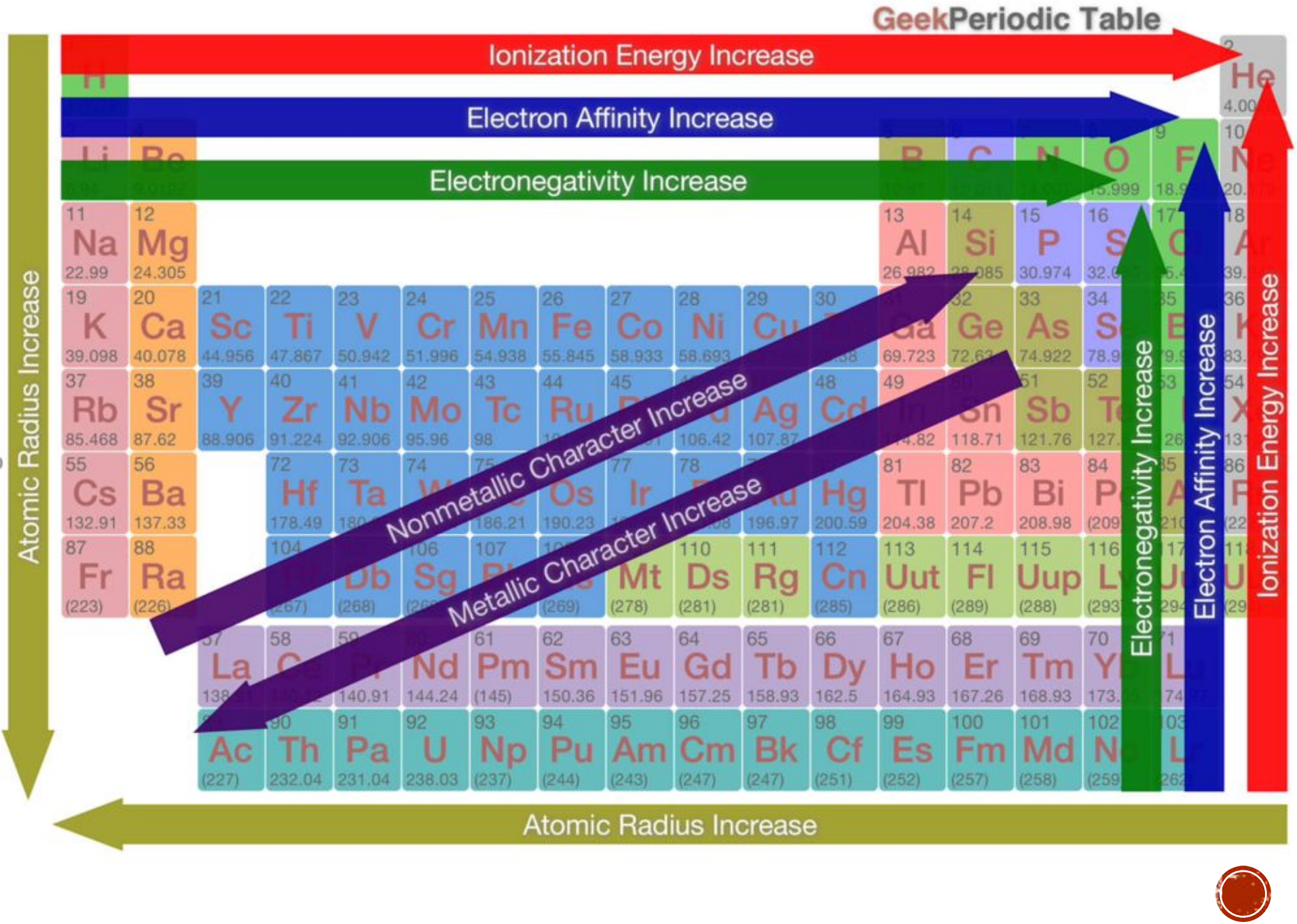
- We see a clear resemblance to the trends in ionization energy…

  - Left to Right: INCREASES
    - Greater charge on the nucleus, causing electron bonding pairs to be very attracted

  - Top to Bottom: DECREASES
    - Increased amount of shielding by inner most electrons.
    - More electrons added between the nucleus and bonding pair, causes the effective nuclear charge to be less
    - The increase in distance between the nucleus and the boding pair decreases the attraction between the two



- Noble Gases **DO NOT** follow this trend


GeekPeriodic Table
Ionization Energy Increase
Electron Affinity Increase
Electronegativity Increase
Atomic Radius Increase
Nonmetallic Character Increase
Metallic Character Increase
Electronegativity Increase
Electron Affinity Increase
Ionization Energy Increase
Atomic Radius Increase

SUCCESS CRITERIA

- **By the end of this lesson…**

- I can use the periodic trends **to predict the properties** of atomic radius, ionization energy, electron affinity and electronegativity **for elements on the periodic table *(undestanding concepts).***
- I can **explain the periodic trends** of atomic radius, ioniation energy, electron affinity, and electronegativity based on **patterns in electron arrangement and forces in atoms *(communication).***