# Chapter 14

# Chemical Periodicity

# Periodic Trends

- An element's placement in the periodic table determines characteristics like the size of the atom, its ability to attract electrons and the stability of its electron configuration.

# Periodic Trends

- Highest occupied principal energy level is equal to the period number of the element.
- i.e. for Calcium (in the 4th period), the highest occupied energy level is n=4

# Atomic Radius

- Size of atoms of each element.
- How will the size of atoms change as we proceed down a group

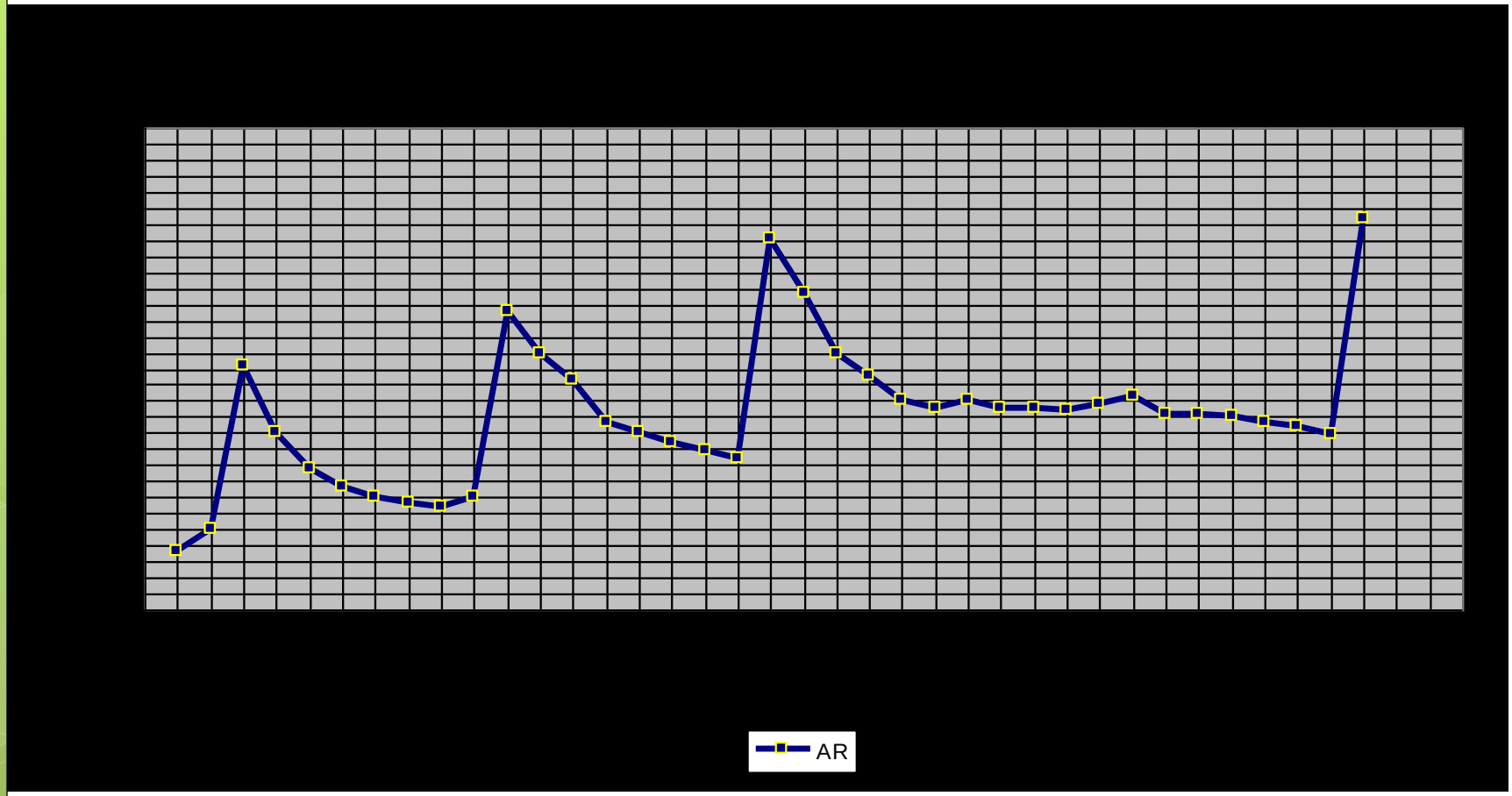
# Atomic Radius

- Oxygen's greater nuclear charge attracts the electrons, causing the atom to contract
- Oxygen is the smallest of the three, Carbon is the largest.

# Atomic Radius

Atomic Radius decreases as we go across a period from left to right and increases from top to bottom down a group.

# Graph of Atomic Radius



# Ionization Energy

- Amount of energy required to remove a valence electron from an atom.
- The more stable an element is, the harder it will be (more energy is required) to remove an electron.

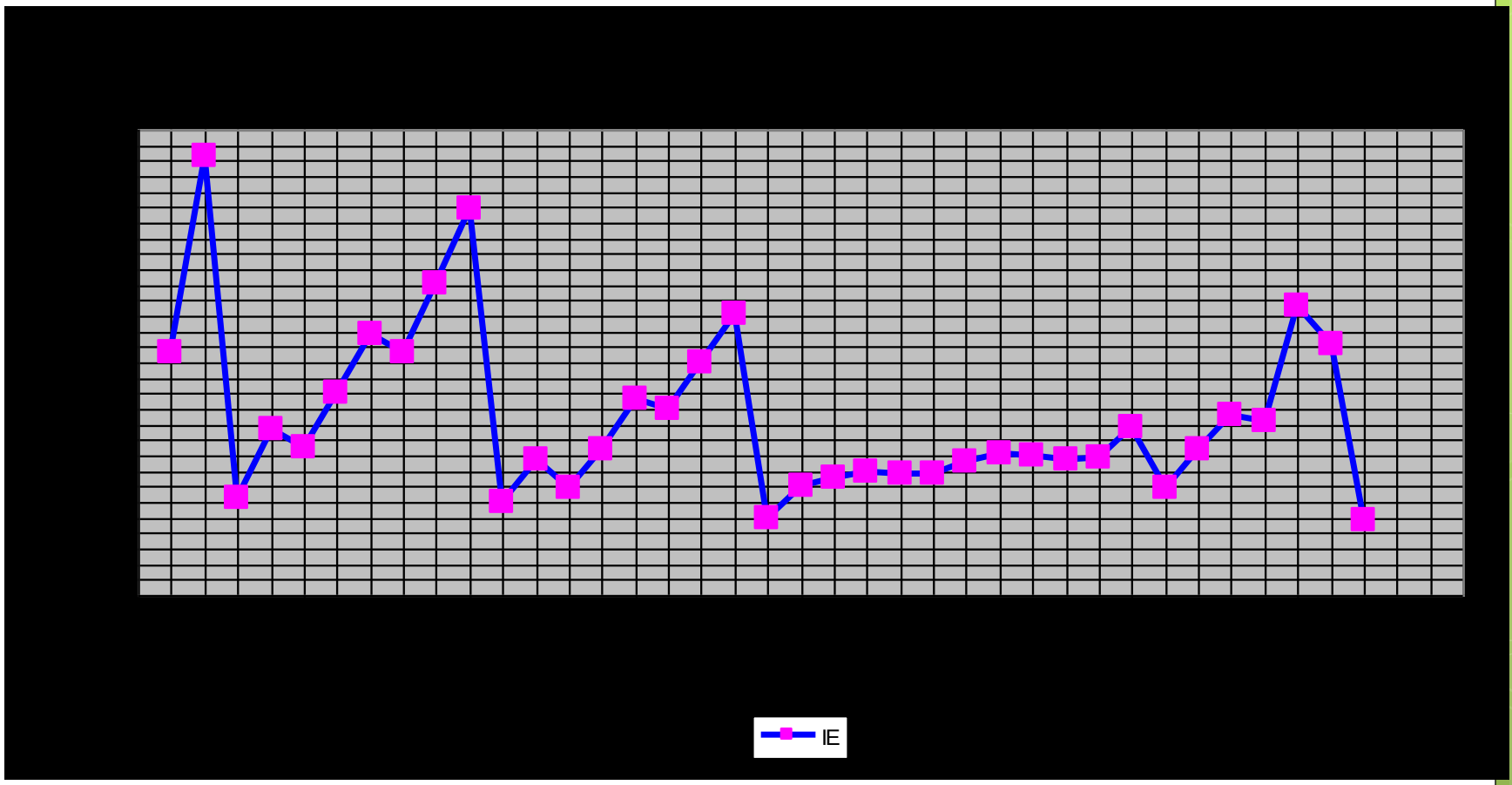
# Ionization Energy

- Some elements become more stable by losing an electron so they lose electrons easily (less energy needed).

# Ionization Energy

Ionization energy increases across a period (left to right) and decreases from top to bottom within a group.

# Graph of Ionization Energy



# Electronegativity

Tendency for an atom to attract electrons to itself when it is chemically combined with another element

# Electronegativity

Elements that need electrons to complete an energy-level will have a high electronegativity.

# Electronegativity

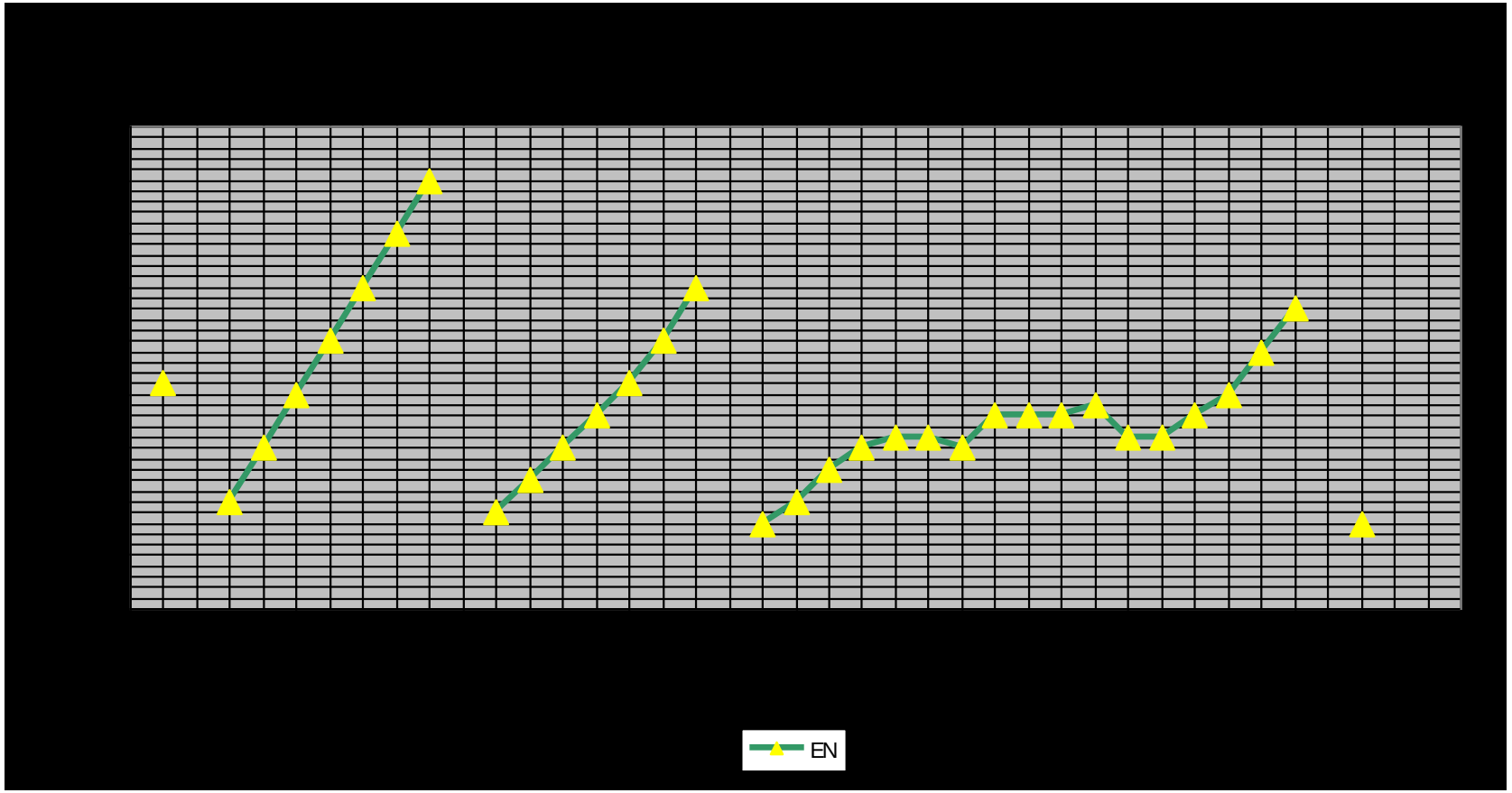
Elements that will be more stable by losing electrons have low electronegativities.

# Electronegativity

Electronegativity increases across a period and decreases from top to bottom within a group (Noble Gases omitted).

Noble Gases do not have electronegativity.

# Graph of Electronegativity



# Metallic Character

Tendency to exhibit metallic properties

- Decreases left to right across period
- Result of other trends
- Increases Down a group
- Result of other trends

# Periodic Trends Review

Important Trends found on the Periodic Table

- Atomic Radius
- Ionization Energy
- Electronegativity
- Metallic Character

# Atomic Radius

## Size of the Atom

Decreases left to right across period

- Caused by increased nuclear charge

Increases Down a group

- Caused by shielding effect

# Ionization Energy

Energy needed to remove one electron

Increases left to right across period

- Caused by increased nuclear charge

Decreases Down a group

- Caused by shielding effect

# Electronegativity

Tendency to attract electrons when bonded

Increases left to right across period

- Caused by increased nuclear charge

Decreases Down a group

- Caused by shielding effect

# Metallic Character

Tendency to exhibit metallic properties

Decreases left to right across period

- Result of other trends

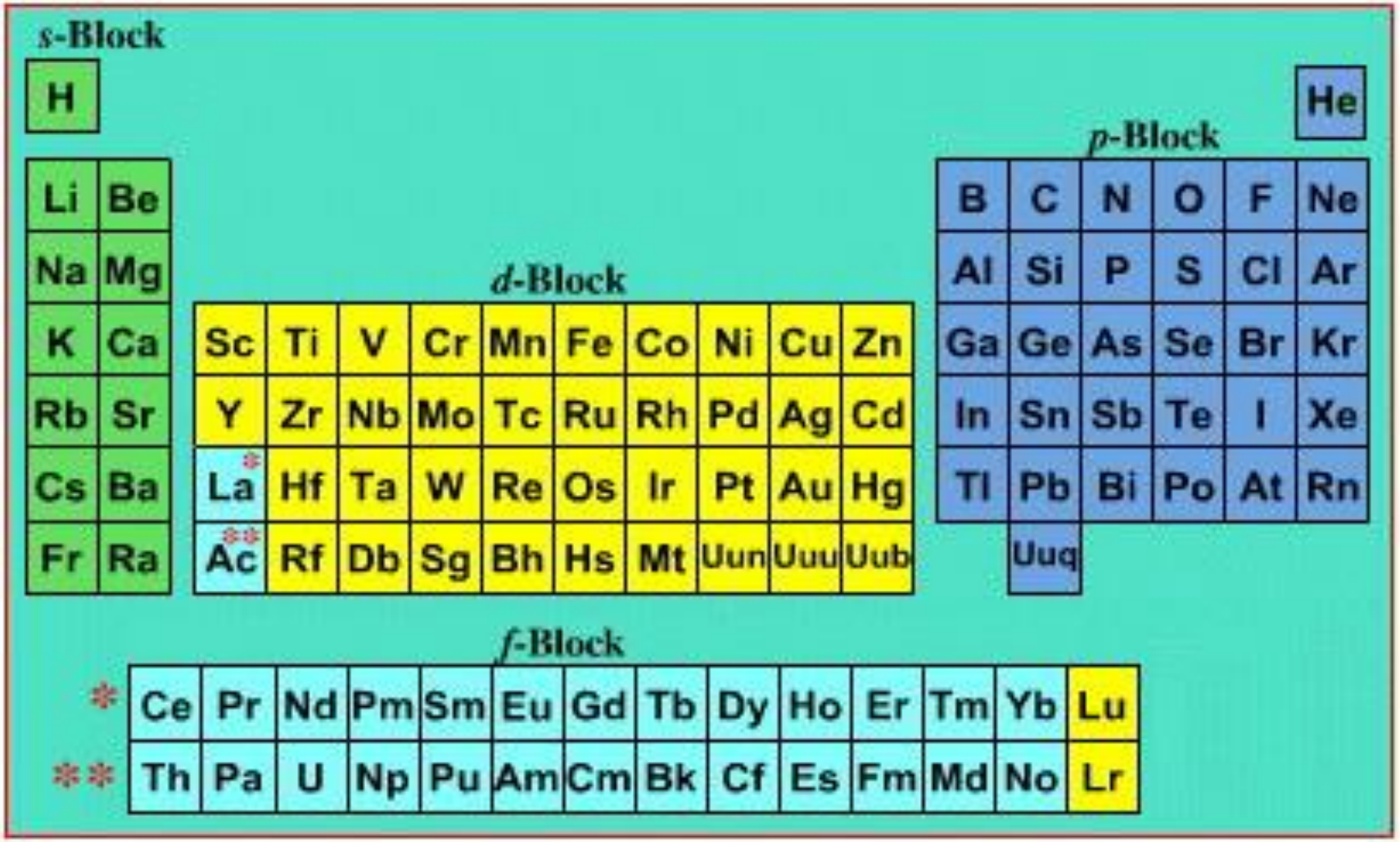
Increases Down a group

- Result of other trends

# The Periodic Table-Review

- An element's position in the Periodic Table dictates its electron configuration.
- The periodic table is broken down into "Blocks"

# Block Diagram



# "S" block

## Groups 1A & 2A

- Electron Configuration ends in an **S** Sub-level.
- Highest occupied energy level is equal to the period number of the element.
  - i.e. Calcium's electron configuration ends in 4s.

# "P" block

## Groups 3A through 8A

- Electron Configuration ends in a **P** Sub-level.
- Highest occupied energy level is equal to the period number of the element.
  - i.e. Silicon electron configuration ends in 3p.

# "D" block

## Group B elements

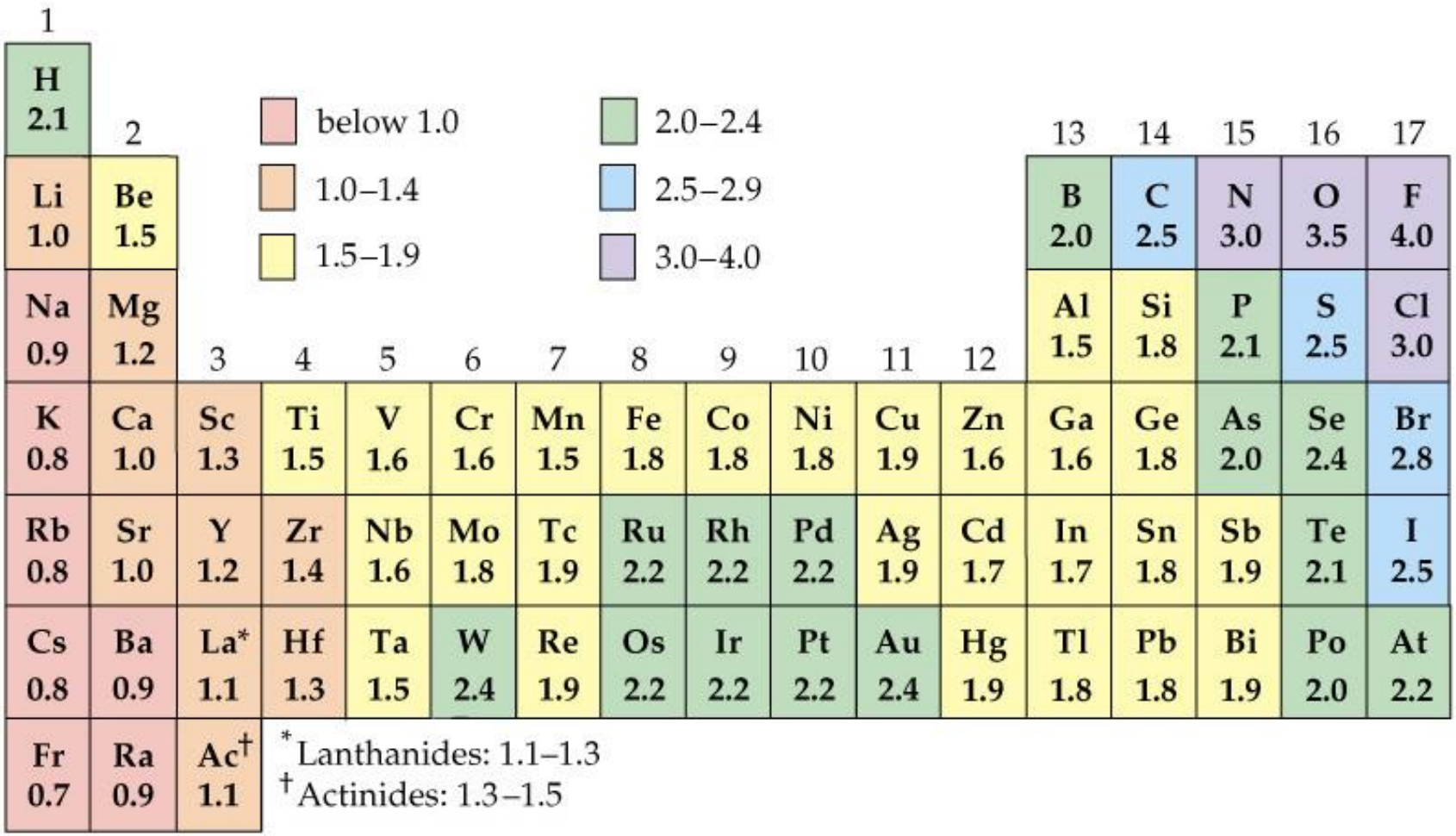
- Electron Configuration ends in a **D** Sub-level.
- The occupied d sublevel has a principle energy level that is one less than the period number of the element.
  - i.e. Silver's electron configuration ends in 4d.

# "F" block

## "Inner Transition Metals"

- Electron Configuration ends in an **F** Sub-level.
- The occupied f sublevel has a principle energy level that is two less than the period number of the element
- i.e. Uranium's electron configuration ends in 5f.

# Periodic Table of Electronegativities



# Summary of Periodic Trends