

### Trend 3 - Ionic Radius

Periodic Table  
of the Elements

- Metallic elements easily lose electrons.
- Non-metals more readily gain electrons.

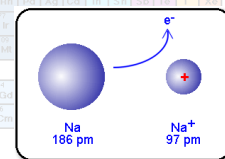
How does losing or gaining an electron effect the size of the atom (ion) ?

* Lanthanide Series	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
* Actinide Series	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

### Positive ions

Periodic Table  
of the Elements

- Positive ions are always smaller than the neutral atom. Loss of outer shell electrons.

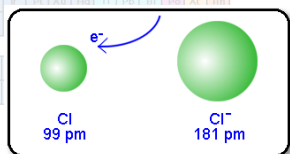


* Lanthanide Series	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
* Actinide Series	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

### Negative Ions

Periodic Table  
of the Elements

- Negative ions are always larger than the neutral atom. Gaining electrons.



* Lanthanide Series	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
* Actinide Series	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

### Ionic Radius trends in periods.

- Going from left to right there is a decrease in size of positive ions.
- Starting with group 5, there is sharp increase followed by a decrease in the size of the anion as you move from left to right.

* Lanthanide Series	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
* Actinide Series	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

### Ionic Radius trends in Groups.

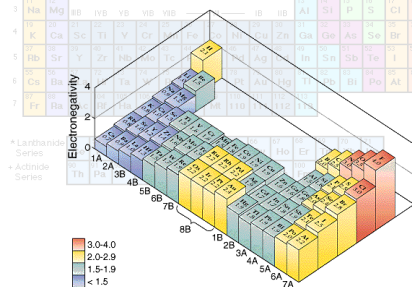
Periodic Table  
of the Elements

- Ion size increases as you move down a column for both positive and negative ions

* Lanthanide Series	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
* Actinide Series	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

### Trend 4– Electronegativity

Periodic Table  
of the Elements



* Lanthanide Series	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
* Actinide Series	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

**Electronegativity:** the ability of an atom in a bond to pull on the electron. (Linus Pauling)

### Electronegativity

Periodic Table of the Elements

- When electrons are **shared** by two atoms a covalent bond is formed.
- When the atoms are the same they pull on the electrons equally. Example, H-H.
- When the atoms are different, the atoms pull on the electrons unevenly. Example, HCl

### Electronegativity

Periodic Table of the Elements

— Two types of Covalent compounds

- 1. Polar Covalent**
  - Has a partially positive and a partially negative side of the molecule because electrons shared unequally
  - Based on electronegativities of atoms, molecular geometry (shape) and bonding-vs-lone pair electrons
- 2. Nonpolar Covalent**
  - Electrons equally shared so no charges exist

- **The bigger the electronegativity difference the more polar the bond.**
  - 0.0 - 0.5 Covalent nonpolar
  - 0.5 - 1.0 Covalent moderately polar
  - 1.0 - 2.0 Covalent polar
  - >2.0 Ionic

### Trends in Electronegativity

Periodic Table of the Elements

- Electronegativity generally decreases as you move down a group.
- Electronegativity of the **representative elements** (Group A elements) increases as you move across a period.

### Electronegativities of Some Elements

Periodic Table of the Elements

Element	Pauling scale
F	4.0
Cl	3.0
O	3.5
N	3.0
S	2.5
C	2.5
H	2.1
Na	0.9
Cs	0.7

### Note

Periodic Table of the Elements

- Most electronegative element is **F** (EN 4.0)
- Least electronegative stable element is **Cs** (EN 0.7)

