Periodic Trends

Ch 6.3

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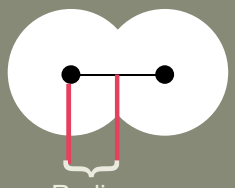
Atomic Size



- Measure the Atomic Radius - this is half the distance between the two nuclei of a diatomic molecule.

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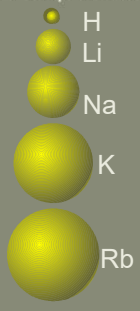
#1. Atomic Size - Group trends

- As we increase the atomic number (or go down a group)...
- each atom has another energy level,
- so the atoms get *bigger*.



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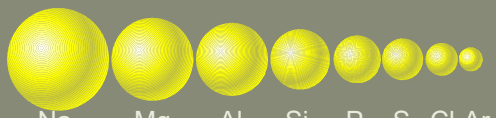
#1. Atomic Size - Period Trends

- Going from left to right across a period, the size gets smaller.
- Electrons are in the same energy level.
- But, there is more nuclear charge.
- Outermost electrons are pulled closer.



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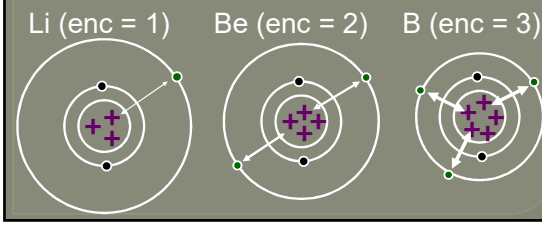

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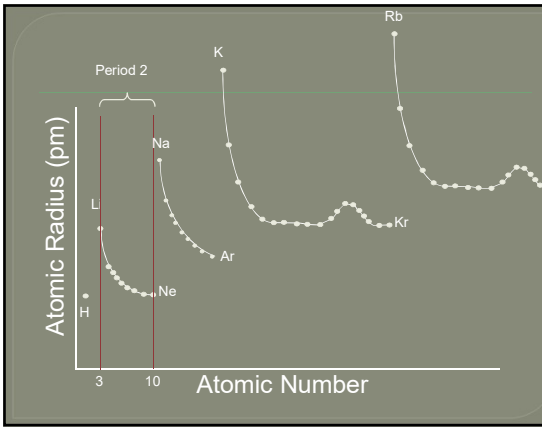

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Atomic radius trend summary

- Atomic radius increases down a column
- Atomic radius decreases across a period

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Ionization Energy - Group trends

- As you go down a group, the first IE decreases because…
  - The electron is further away from the attraction of the nucleus, and
  - There is more shielding.

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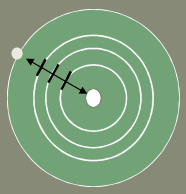
Shielding

- The electron on the outermost energy level has to look through all the other energy levels to see the nucleus.
- Second electron has same shielding, if it is in the same period



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Ionization Energy - Period trends

- All the atoms in the same period have the same energy level.
- Same shielding.
- But, increasing nuclear charge
- So IE generally increases from left to right.

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IE trends summary

- Large atoms more willing to give up e-, low IE
- Small atoms are less willing, high IE
- IE decreases down a column
- IE increases across a period

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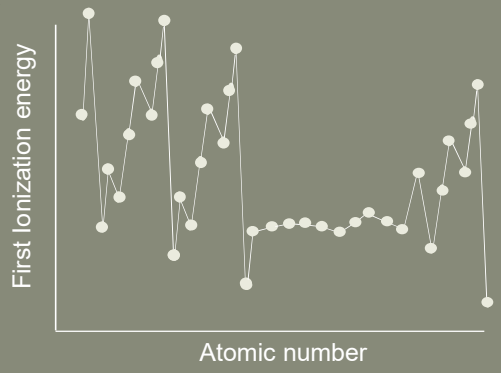

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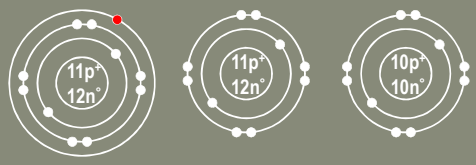
Size of Ions



Na has 11 electrons | Na^+ has 10 electrons | Ne has 10 electrons

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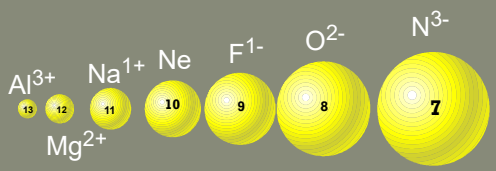
Size of ions

- Positive ions that have more protons would be *smaller* (more protons would pull the same # of electrons in closer)



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Ion size summary

- Positive ions get smaller
- Negative ions get larger

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Electronegativity Group Trend

- The further down a group, the farther the electron is away from the nucleus, plus the more electrons an atom has.
- Thus, more willing to share.
- Low electronegativity.

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Electronegativity Period Trend

- Metals are at the left of the table.
- They let their electrons go easily
- Thus, low electronegativity
- At the right end are the nonmetals.
- They want <u>more</u> electrons.
- Try to take them away from others
- High electronegativity.

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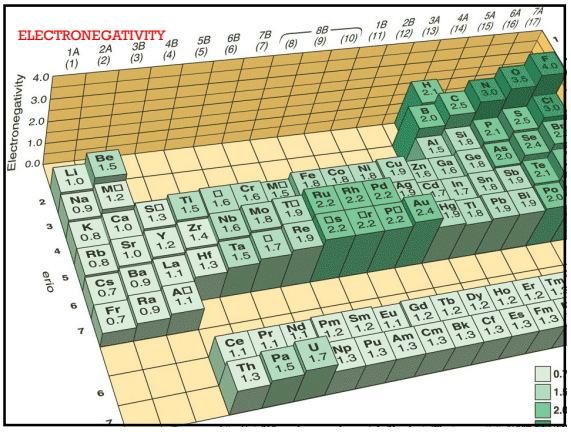

Electronegativity trends summary

- Fluorine is the MOST electronegative (biggest e^- hog)
- As you move farther away from F electronegativity DECREASES
- Electronegativity decreases down a column
- Electronegativity increases across a period

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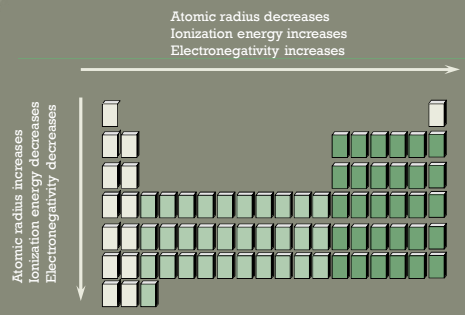

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Trend Practice

- Identify which element has the LARGER ionization energy:
  - Sodium or potassium
  - Magnesium or phosphorus
- Arrange the following in order of INCREASING electronegativity:
  - Oxygen, fluorine, and sulfur

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Trend Practice (cont)

- Arrange in DECREASING atomic size:
  - Sulfur, chlorine, aluminum, sodium
  - Barium, molybdenyum, argon, francium, tin, silicon

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