



- Which is smaller?
  - N is smaller because it has fewer occupied energy levels.
  - F is smaller because although it has more electrons, those electrons are in the same energy level. That might make you think that they are the same size, but they are not the same, F is smaller because there are more protons pulling on those electrons that are no further away from the nucleus, so the higher effective nuclear charge pulls the outer valence electrons in closer.
- Which has the larger first ionization energy
  - Mg has a larger ionization energy because it is harder to remove an electron from a smaller atom, due to fewer occupied energy levels, thus the valence electron would be closer to the nucleus that is holding it in place.
  - P has a larger ionization energy because it is harder to remove an electron from a smaller atom due to the increased effective nuclear charge, since the electron would be closer to the nucleus that is holding it in place.
- Writing equations to represent ionization energy
  - $\text{Al} + \text{IE} \rightarrow \text{Al}^+ + \text{e}^-$
  - $\text{Al}^{2+} + \text{IE} \rightarrow \text{Al}^{3+} + \text{e}^-$
- You should notice that the extraordinarily high increase in IE always occurs at one more than the number of valence electrons. This is because that is when you are trying to ionize an electron from an energy level one level closer to the nucleus than the previous ionization.
  - Ca has 2 electrons in its 4<sup>th</sup> energy level, after they are ionized, it is extremely difficult to remove the third electron because it is being removed from an energy level closer to the nucleus.
  - P has 5 electrons in its 3<sup>rd</sup> energy level, after they are ionized, it is extremely difficult to remove the sixth electron because it is being removed from an energy level closer to the nucleus.
  - Cs has 1 electrons in its 6<sup>th</sup> energy level, after it is ionized, it is extremely difficult to remove the second electron because it is being removed from an energy level closer to the nucleus.
  - Ga has 3 electrons in its 4<sup>th</sup> energy level, after they are ionized, it is extremely difficult to remove the fourth electron because it is being removed from an energy level closer to the nucleus.
- Consider the model of atoms shown:
  - A would be to the right of B because the size of atoms get smaller as you proceed across a period (row) due to the increased effective nuclear charge pulling on electrons in the same energy level.
  - A would be above B because atomic size gets smaller as you proceed up a group (family or column) since there are fewer occupied energy levels.
- The Periodic Table
  - It is called the periodic table because there are repeating or cyclical patterns that occur in each row of the chart and properties with those repeating patterns are stacked up in each column of the table.
  - Other things that are periodic are time (hours of the day, days of the week, months of each year, seasons), bell schedule in school, phases of the moon, menstrual cycle in women (notice its called a period ! ), pay day at work.

