**Periodic Trends Homework**

1. Why does atomic radius decrease as you move across the periodic table from left to right?
2. Which atomic radius is larger: Mg or Al; Sr or Ba? Explain why.
3. What is ionization energy? Explain the trend in both groups (columns) and periods (rows).
   1. Which has a higher ionization energy: Bromine or Iodine? Chlorine or Neon?
4. What’s the difference between electronegativity and ionization energy?
5. Why, despite both being in the top right corner of the periodic table, does fluorine have a very high ionization energy AND electronegativity…yet neon has a high ionization energy and an electronegativity of zero?

4) Identify the largest ion and smallest ion of the group: Se2-, Br1-, Kr, Rb1+, Sr2+. Explain why.

5) What does the octet rule have to do with the periodic trends?

6) The first ionization energy of beryllium is 9.322 eV, the second ionization energy is 18.211 eV, and the third ionization energy is 153.893 eV. Explain why the third ionization energy of beryllium so much higher than the first two.

**Periodic Trends Homework**

1) Why does atomic radius decrease as you move across the periodic table?

As you move from left to right on the periodic table the number of core electrons stays the same but the number of protons increases. This increase in effective nuclear charge pulls the valence electrons closer to the nucleus, resulting in a smaller radius.

2) How are the trends of atomic radius and ionization energy related? Explain in both groups and periods.

These trends are inverses of each other. As the size of the atom increases, the ionization energy (energy required to remove the electron) decreases because the electron being removed is farther from the nucleus in a larger atom. Less energy is required to remove an electron further from the nucleus. [AR increases down a group while IE decreases; AR decreases across a period while IE increases.]

3) What’s the difference between electronegativity and ionization energy?

Electronegativity is related to the pull of a nucleus on an electron being shared in a bond. Ionization energy is the energy required to remove an electron from an unbonded atom. Electronegativity is a ranking and has no units. Ionization energy is an amount of energy and has units such as kilojoules.

4) What does it mean to be isoelectronic? Identify the largest ion and smallest ion of the group: Se2-, Br1-, Kr, Rb1+, Sr2+. Explain why.

Isoelectronic means a group of atoms/ions having the same number of electrons. All of the atoms in this group have 36 electrons; each atom/ion has the same number of core electrons and the same amount of electron shielding. What they don’t have in common (and what accounts for the difference in size) is the number of protons. The atom/ion with the most protons will be smallest (Sr2+) while the atom/ion with the lowest number of protons will be largest (Se2-).

5) What does the octet rule have to do with the periodic trends?

A trend like ionization energy is very closely related to the octet rule. The halogens are the smallest of atoms and the closest to the having a full octet. Since gaining an electron would give these atoms a full octet, the amount of energy required to remove an electron (IE) would be very high. When determining the charge an atom will have (as in number 4), the number of electrons gained or lost is the number required to have a full octet of electrons.

6) The first ionization energy of beryllium is 9.322 eV, the second ionization energy is 18.211 eV, and the third ionization energy is 153.893 eV. Explain why the third ionization energy of beryllium so much higher than the first two.

[eV is a electronVolt and is a unit of energy] When Be has lost two electrons to become Be2+ it has the electron configuration of a noble gas (He). This electron configuration is very stable, so a much larger amount of energy is required to remove the third electron.