CHEMISTRY ANSWER KEY

Name: _____   **Date:** _____

The first and second ionization energies of magnesium are both relatively low, but the third ionization energy requirement jumps to five times the previous level. Explain. What is the most likely ion for magnesium to become when it is ionized?

Mg is more likely to become a cation with a 2+ charge by giving up 2 e- from the 3s sublevel. Mg more readily gives up these two e- thus requiring low IE to remove them. However, once the two 3s e- are removed, then Mg has an electron configuration of a noble gas (Ne). Therefore it is unwilling to give up the next e- as easily thus requiring a larger 3rd IE to remove the 3rd e-.

Explain the difference in first ionization energy between lithium and beryllium.

As you travel across the PT, the atomic number increases because the number of p+ are increasing with each consecutive atom. With the increase in p+ comes an increase in nuclear charge. The nucleus of the Be atom has a greater positive charge, thus wants to hold on more tightly to the 2 e- located in the 2s sublevel. No additional e- are added to the inner core so no additional shielding takes place. Therefore, Be requires more ionization energy to remove the first e- in the 2s sublevel.

Compare the first ionization energies for the noble gases.

He has the highest 1st IE of any element on the PT. The remaining noble gases have the highest 1st IE of any element in their respective periods. However, 1st IE values decrease as you travel down the Nobel gas family to Ra with the lowest IE of the Noble gas family. While still the the highest IE in the 7th row, Ra is a larger atom with more inner core electrons of any atom I the family, thus the IE for the Ra e- is the lowest.

Which has the larger ionization energy - sodium or potassium? Why?

Na has the larger 1st ionization energy (495) because the lone e- in the 3s sublevel feels more of the pull from the nucleus in the Na atom. There are fewer inner core e- shielding the 3s e- so more IE is needed to remove the first e-. In the K atom, the 1st IE is smaller than that of Na (418 to 495). Potassium is located in period 4, the e- is further from the nucleus, does not feel the pull of the nucleus as tightly. The inner core e- are shielding the 4s e- thus requiring less energy to remove the e-.

When totaling all IE for the electrons of the atoms, K has the greater total IE because more e- are removed thus requiring more total energy.

What is the most common oxidation number for calcium? Explain.

The last page of the powerpoint on Chemistry, Atoms and Ions provides the definition of oxidation number as the charge on the ion. You were also asked to define this term in your element brochure. Pages 222 and 980 of your text book defines oxidation number as the positive or negative charge of a monatomic (one atom) ion. These numbers may be confirmed on many of the websites you have used
Calcium will have a 2+ oxidation number as it tends to easily lose its 2 valence electrons, the $4s^2$ electrons