Worksheet:

1. The term "isoelectronic" simply means "has the same electron configuration." No two different atoms can have the same configuration of electrons, but ions may share the same electronic configuration of other atoms or ions (especially noble gas configuration). Group the elements and ions below in groups that are isoelectronic. You might want to group them around the noble gas they match.

a. Cs^+
b. Xenon
a and k
c. F^-
d. K^+
e. O^{2-}
f. Na^+
g. He
l;
h. Ne
c; e; f;
i. Ar
j; d; n; m
j. Ca^{2+}
k. Ba^{2+}
l. Li^+
m. S^{2-}
n. Cr^{6+}

2. Consider an ion that is 3+ and has 2 electrons with n=1, 8 with n=2 and 13 with n=3. It's mass is about 54 AMU.
   a. Write the electron configuration of the ion.

   b. What is the parent element?

   c. How many neutrons are there in this isotope?

   d. How many electrons are their with l=1? (on all levels that have one)

   e. How many electrons are their with l=2?

   f. This element also makes a 2+ ion. What would be the configuration of electrons in that ion?

Worksheet:

3. Determine the wavelength of a golfball thrown at Becca with a mass of .04593Kg and a velocity of 33.97 m/s. (Assume the day of the week is Saturday and it is in the summer time).

$$\lambda = \frac{h}{mv} = \frac{6.63\times10^{-34}\ \mathrm{Kg\cdot m^2/s}}{0.04593\mathrm{Kg}\times 33.97\ \mathrm{m/s}} = 4.25\times10^{-34}$$

4. Sodium salts glow yellow when heated. The wavelengths of visible light emitted are 589.0 and 589.6 nm for the two yellow lines. What are the energies associated with those lines?

   The second one is almost the same. It should have a negative value, since it is energy coming out, and the electron is losing energy.

$$E_{photon} = \frac{hc}{\lambda} = \frac{6.63\times10^{-34}\ \mathrm{Kg\cdot m^2/s}\times 3.00\times10^{8}\ \mathrm{m/s}}{5.89\times10^{-7}\ \mathrm{m}} = 3.37\times10^{-19}$$

5. The valence electrons of sodium in the ground state are in the 3s orbital, which has an energy value of -8.235x10^{-19} J. If the yellow lines are due to transitions from the 3p orbitals to the ground state, what is the energy of the 3p orbital?
   The key thing is that $E_{photon} = \Delta E_{electron} = E_{final} - E_{initial}$. You know E_{photon} and E_{final} You just solve for $E_{initial}$. So, $E_{3p} = E_{final} - E_{photon}$ The other key points are that the value of E_{photon} is negative and since the energy values are negative for all levels, the lower (s) orbital has a *more negative* value. The answer is: 4.87x10^{-19}

6. Order from least to greatest radius:
   a. sodium atom, chlorine ion, Sulfur atom, chlorine atom, Beryllium ion.
      Be^{2+}; Cl, S, Na; Cl^-. The last one is a little ambiguous.

7. Without looking up the numbers, would you expect the atomic radius of lithium to be most similar to that of beryllium, magnesium or sodium? (remember the diagonal rule).
   Mg