Chem 1061
Fall 2004
Quiz 3 (Take-home quiz)

The following problems are due Thursday, Dec 2 at the beginning of class.

1. Calculate the energy of the photon emitted when an electron in a hydrogen atom undergoes a transition from energy level n = 3 to level n = 2. What frequency and wavelength light does this correspond to?

$$E_{\text{photon}} = E_i - E_f$$
$$= \frac{-R_h}{3^2} - \frac{-R_h}{2^2}$$
$$= -R_h\left(\tfrac{1}{9} - \tfrac{1}{4}\right) = 3.026 \times 10^{-19}\ \text{J}$$
$$\nu = \frac{E}{h} = \frac{3.026 \times 10^{-19}\ \text{J}}{6.63 \times 10^{-34}\ \text{J} \cdot \text{s}} = 4.56 \times 10^{14}\ \text{s}^{-1}$$
$$\lambda = \frac{c}{\nu} = \frac{3.00 \times 10^{8}\ \text{m/s}}{4.56 \times 10^{14}\ \text{s}^{-1}} = 6.57 \times 10^{-7}\ \text{m} = 657\ \text{nm}$$

2. Write the full electron configuration for Germanium (Z = 32) and the abbreviated electron configuration for Lead (Z = 82).

   Ge = $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $4s^2$, $3d^{10}$, $4p^2$
   Pb = [Xe] $6s^2$, $4f^{14}$, $5d^{10}$, $6p^2$

3. Write the abbreviated electron configurations for the following ions: S^-, S^{2-}, Al^{3+}, Sn^{2+}, and Fe^{3+}.

   S^- = [Ne] $3s^2$, $3p^5$
   S^{2-} = [Ne] $3s^2$, $3p^6$
   Al^{3+} = [Ne]
   Sn^{2+} = [Kr] $5s^2$, $4d^{10}$
   Fe^{3+} = [Ar] $3p^5$