Due: Wednesday, 31-October-2007 at the beginning of class. You may use your textbooks for any thermochemical data you need, but this is to be your own work! Really!!

1) Which of the following electron diagrams are allowed, and which are not. For the allowed diagrams, write the electron configuration (i.e. 1s\(^2\)2s\(^2\) and so on.); for the "not allowed", please write a corrected diagram. Note that each part requires two answers: “allowed” or “not allowed” and either a configuration (1s\(^2\)…) or a corrected diagram.

a) \((↑↓)(↑↓)(↑↓)(↑↓)(↑↓)\)  
\begin{align*}  
1s & \quad 2s & \quad 2p \\
\end{align*}

b) \((↑↓)(↑↓)(↑↓)(↑↑)\)  
\begin{align*}  
1s & \quad 2s & \quad 2p \\
\end{align*}

c) \((↑↓)(↑↓)(↑↑)(↑↑)(↑)\)  
\begin{align*}  
1s & \quad 2s & \quad 2p \\
\end{align*}

d) \((↑↓)(↑↓)(↓↓)(↓↓)(↓)\)  
\begin{align*}  
1s & \quad 2s & \quad 2p \\
\end{align*}

2) A sample of strontium metal reacted completely (and safely!) with water, evolving 53.2 mL of dry H\(_2\) at 22.5°C and 788 mm Hg. What is the equation for this reaction? What is the mass of francium in the sample.

3) Calculate the ionization energy of the He\(^+\) ion in kJ/mol. (This would be the second ionization energy of He). The Bohr formula for the energy levels of an ion consisting of a nucleus of charge \(Z\), and a single electron is: 
\[ \frac{-R_HZ^2}{n^2}. \]  
(Hint: This is the same as calculating the energy of the transition from \(n = 1\) to \(n = \infty\).

4) Calculate the \(\Delta H\) for the following process:

\[ \text{Cs(g)} + \text{F(g)} \rightarrow \text{CsF(s)} \]

The lattice energy of CsF\(_s\) is 740 kJ/mol and the ionization energy of Cs\(_{g}\) is 589.8 kJ/mol. The electron affinity of F\(_{g}\) can be found in your textbook. The lattice energy is that energy which is required to break an ionic solid into the gas phase ions.

5) Some periodic tables show hydrogen at the top of both Group 1 (IA), and Group 17 (VIIA). What property or properties of hydrogen justify this dual placement?