Unit 1, Homework No. 2:
Electron Configurations, Lewis Structures, and the VSEPR Model

Date issued: Monday, September 12, 2011. This homework is due on or before September 16, 5:00 pm. Late homework assignments will not be graded. Solutions will be available on the Monday after the due date.

1. The ionization of the valence electron of sodium can be described by the equation $Na\ (g) \rightarrow Na^{+}\ (g) + e$
   What is the electron configuration of Na and the cation Na^{+}?

2. Write down the electron configuration of the following atoms and ions.
   (a) Br, (b) I^{-}, (c) Ca^{2+}, and (d) Ba^{2+}

3. Write down the electron configurations of the following transition metal ions.
   (a) Fe^{2+}, (b) Fe^{3+}, (c) Zn^{2+}, and (d) Co^{2+}

4. The configuration $1s^2 2s^2 2p^4 3s^1$ represents a cation in its *excited* state. Identify the cation. Would you expect this cation to be easily formed compared to cations like Li^{+} and Na^{+}?

5. Provide the Lewis structures of the following acids and bases. Assign formal charges to all atoms.
   (a) Hypochlorous acid, HClO, (b) acetic acid, CH_3COOH, (c) sulfuric acid, H_2SO_4, (d) ammonium hydroxide, NH_4OH, (e) oxalic acid, $(COOH)_2$, and (f) formic acid, HCOOH

6. Obtain Lewis structures for the following organic compounds. Assign all formal charges, and clearly sketch the shape of the molecule.
   (a) C_2H_6, (b) C_2H_4, (c) C_2H_2, (d) CH_3SO_4Na, (e) C_6H_6, and (f) CH_3CO_2H.

7. Predict the molecular structure (shape) and the bond angles for each of the following.
   (a) PCl_3, (b) PCl_5, (c) SF_4, (d) SF_6, (e) ICl_3, and (f) ICl_5

8. Draw Lewis structures for the following, showing all resonance structures, where applicable.
   (a) SCN^{-}, (b) OCN^{-}, (c) N_2O_4, and (d) N_3^{-}