

General Chemistry II
Problem Set 4
Due Friday, October 8, 2004

Note: You should always indicate all non-zero formal charges on Lewis structures. However, formal charges are often left off representations of three-dimensional shape.

1. (25 points total) For each of the following species, do the following:
 - (i) Draw the Lewis structure. Include multiple resonance structures if they are required by the symmetry of the species.
 - (ii) Write down the coordination number and steric number for the central atom of each structure, and then name the shape of the molecule.
 - (iii) Draw the shape of the species. Include the locations of all lone pairs on the central atom.

(a) PF_3 ; (b) TeH_2 ; (c) PF_6^- ; (d) ClO_2^- ; (e) GeH_4 .
2. (21 points total) For each of the following species, do the following:
 - (i) Draw the Lewis structure. Include multiple resonance structures if they are required by the symmetry of the species.
 - (ii) Write down the coordination number and steric number for the central atom of each structure, and then name the shape of the molecule.
 - (iii) Draw the shape of the species. Include the locations of all lone pairs on the central atom.
 - (iv) Write down the ideal bond angles (*e.g.* ideal: $\theta(\text{H-O-H}) = 109.5^\circ$).
 - (v) Writing an inequality, note any expected deviations from ideal bond angles (*e.g.* reality: $\theta(\text{H-O-H}) < 109.5^\circ$). (If you do not expect any deviations, note that as well.) You need not justify your answers.

(a) AsF_3 ; (b) PCl_4^+ ; (c) SF_2 .
3. (8 points) Classify the eight species in #1 and #2 as polar or nonpolar. You need not justify your answers.
4. (25 points) For the following species:
 - (i) Draw the Lewis structure. Include multiple resonance structures if they are required by the symmetry of the species.
 - (ii) Write down the coordination number and steric number for the central atom of each structure, and then name the shape of the molecule.
 - (iii) Draw the shape of the species. Include the locations of all lone pairs on the central atom.

(a) BeF_2 ; (b) ClF_2^+ ; (c) SnCl_2 ; (d) XeF_2 ; (e) XeF_4

[Problem Set continues on the back side]

5. (15 points) For the compound SOF_4 , do the following:
- (i) Draw the Lewis structure.
 - (ii) Determine the central atom's coordination number and steric number, and the compound's shape.
 - (iii) Draw the stereochemical formula. If relevant, label atoms as equatorial (eq) and axial (ax) to facilitate completing parts (iv) and (v).
 - (iv) Write down the ideal bond angles. (Hint: There are four angles.)
 - (v) Writing inequalities, note any deviations from ideal bond angles.
 - (vi) Explain the expected deviations from the ideal bond angles.