CH301H – Principles of Chemistry I: Honors
Fall 2017, Unique 500135

Homework, Week 3

1. From data in Tables 3.1 and 3.2, determine the bond dissociation energy for NaCl, which has an equilibrium bond length of 2.36 Å.

2. Draw the Lewis dot structure of each of the following molecules, including all resonance structures. Determine the formal charge on each atom.

a) P_4
b) HNO
c) XeF^+
d) XeF_2
e) SCN^-
f) H_3NBF_3
g) CH_3COO^-
h) HCO_3^-

3. Ozone (O_3) has a nonzero dipole moment. Draw the Lewis dot structure of O_3 and determine which of the following structures are possible for the molecule: linear and symmetric, linear and nonsymmetric, or bent.

4. Arrange the following covalent diatomic molecules in order of a) increasing bond length and b) increasing bond energy: BrCl, IBr, BrF.

5. For each of the following pairs of molecules, determine which molecule has the higher vapor pressure at room temperature.

a) CI_4 versus KI
b) BaF_2 versus OF_2
c) SiH_4 versus NaH

6. In the water molecule, each O-H bond has a dipole moment. Because of the structure of the molecule, these two bond dipole moments lead to a molecular dipole moment. Show that if μ_{OH} is the dipole moment of the O-H bond and θ is the angle between the two O-H bonds, then the molecular dipole moment of water, μ_{H2O} is

$$\mu_{H2O} = 2\mu_{OH}\cos\left(\frac{\theta}{2}\right)$$

The molecular dipole moment of water is 1.86 D. What is the O-H bond dipole moment?