CH301H – Principles of Chemistry I: Honors
Fall 2011, Unique 51040

Practice Exam 1

Name: _____

You may use your textbook and a calculator for completing arithmetic.

Honor Code:

"The core values of the University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community."

I certify that the work on this exam is entirely my own.

_____
Signature Date

1. True / False. Indicate whether each of the following statements are true, false, or if there is no way to know (NWTK) from the information given.

a. True False NWTK The second ionization energy of Mg is lower than the first.

b. True False NWTK According to the Mulliken electronegativity scale S has a higher electronegativity than N.

c. True False NWTK When an anion and a cation are held apart at infinite distance, the potential energy of the system will always be > 0.

d. True False NWTK The molecule N_2 is polar.

e. True False NWTK All atoms with high ionization energy will also have a high electronegativity.

2. Lysine ($RCH_2CH_2CH_2CH_2NH_2$) is a natural amino acids (R is a variable meaning "any atom"). The base has a pK_a values greater than 7, and so under physiological conditions, the base is protonated. Draw the Lewis dot structure of the molecule under physiological conditions.

3. The bond length in HBr is 1.424 Å.

a) Determine the bond dissociation energy of HBr.

b) The actual dissociation energy of HBr is 363 kJ mol^{-1}. What does this say about the bonding in HBr?

c) The dipole moment of HBr is 0.828 D. Estimate the partial charges on each atom. Does this make sense given your answer to the previous part of the problem?

4. The ionization energy of Hydrogen is 13.6 eV, and the second ionization energy of He is 54.4 eV. Using only classical ideas compare the radius of He^{+} to the radius of H.

5. At what separation will a neutral pair of K and F atoms have the same potential energy as a pair of ions K^+ and F^-? Assume zero attractive force for the neutral pair.

6. The pK_a of formic acid (CHOOH) is 3.8. Draw the Lewis dot structures of formic acid at a) pH = 1 and b) pH = 7.