CHM151 Quiz 8 25 Pts Spring 2014 Name: Key

1. (3 Pts) Estimate the enthalpy change for the reaction $2CO + O_2 \rightarrow 2CO_2$ given the following bond energies.
   BE(C≡O) = 1074 kJ/mol
   BE(O=O) = 499 kJ/mol
   BE(C=O) = 802 kJ/mol

   $2\,C\equiv O + O_2 \rightarrow 2\,O=C=O$

   A) +2380 kJ/mol
   B) +1949 kJ/mol
   C) +744 kJ/mol
   D) −561 kJ/mol
   E) −744 kJ/mol

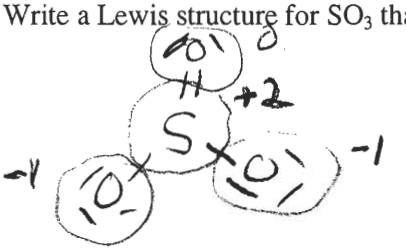
2. (2 Pts) The following successive ionization energies correspond to an element in the third row of the periodic table: I_1 = 786.3 kJ/mol, I_2 =1,580 kJ/mol, I_3= 3,230 kJ/mol, I_4 = 4,360 kJ/mol, I_5 = 16,000, and I_6 = 20,000 kJ/mol. Based on this pattern of ionization energies, identify the element from these choices:
   Mg, Al, Si, P, S, Cl.

3. (2 Pts) Which one of the following is most likely to be an ionic compound?
   A) $CaCl_2$ B) CO_2 C) CS_2 D) SO_2 E) OF_2

4. (2 Pts) Which species has the greater radius, an I^- ion or an I atom? Briefly explain your choice of answer.
   I^- same # of protons, I^- one more e^-

5. (2 Pts) Why is the Mg^{2+} ion smaller than F^-, even though they are isoelectronic?
   Mg^{2+} has a higher nuclear charge

6. (2 Pts) a. Write a Lewis structure for SO_3 that obeys the octet rule, showing all non-zero formal charges,



   b. (1 Pt) What is the total number of resonance structures for SO_3 that obey the octet rule? 3

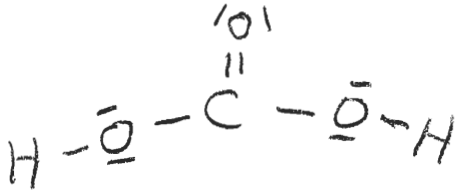
7. (2 Pts) Which one of the following is most likely to be a covalent compound?
   A) Rb_2O B) BaO C) SrO D) SeO_2 E) MnO_2

***More questions on the back.

Key

8. (2 Pts) Which one of the following compounds utilizes both ionic and covalent bonding?
   A) Na_2SO_4
   B) $AlCl_3$
   C) PO_4^{3-}
   D) NH_4^+
   E) CaO

9. (3 Pts) Carbonic acid, H_2CO_3, is a weak acid that contributes to the taste and produces the carbon dioxide bubbles in all carbonated beverages. Write a Lewis structure for H_2CO_3 that obey the octet rule. (hint: carbon is the central atom and the hydrogens are attached to the oxygen atoms.



10. (2 Pts) Write a Lewis structure for the chlorite ion, ClO_2^-, that obeys the octet rule, .

11. (2 Pts) Write a Lewis structure for OF_2.