*CH301 Fall 2009 Worksheet 4: A Lovely Worksheet on part of Chapter 2. Great for Exam 1. *

1. Draw Lewis structure for the following ionic compounds and answer the questions posed.
   a. A salt formed from aluminum and oxygen. What is the unit formula? What is the total number of electrons exchanged? Which species gives up electrons?

   b. A salt formed from magnesium and sulfur. What is the unit formula? What would be its name? How many electrons are exchanged?

   c. A salt formed from ammonium (NH_4^+) and nitrate (NO_3^-). What sort of bonds are present in this salt?

2. Draw Lewis structure for the following species and decide which would exhibit resonance. Name the electronic geometry of each molecule as well.
   a. O_3

   b. NH_3

   c. PO_4^{3-} (see the "formal charge" topic in your course notes to get the correct structure.)

   d. HCN

3. How many resonance structures would each of the following species exhibit?
   a. C_6H_6, aka benzene (hint: the carbons form a ring and the molecule is symmetrical)

   b. NO_2

   c. H_2O

4. Define resonance in your own words.

5. Draw the Lewis structure for each of the following.
   a. CH_3NHOH

   d.H_2O_2

c.CH_3SCH_3

6. Members of which group on the periodic table would be most likely to form stable compounds with fewer than 8 valence electrons? Why? Give an example, draw its Lewis structure.

7. Which element always fails to satisfy the octet "rule" and yet is always "happy?"

8. a. An atom, ion or molecule which has an odd number of valence electrons is called what?

b. In such a molecule, which atom will most likely have the unpaired electron?

9. Without drawing Lewis structures, consider the atoms, ions and molecules below and cross out the ones that **aren't** radicals.
NH_3 H Li^+ F_2 H_2O_2 N NO NO_2 NO_3^- PO_4^{3-} Cl C_6H_6 CH_4 I I_3^-

10. Draw Lewis structures for the compounds below.
a. C_2H_6

b. C_2H_4

c. C_2H_2

11. Consider the list of compounds below. Cross out any compounds that **cannot** exist.
XeF_6 NO_4^{3-} OF_6 I_3^- SO_4^{2-} NO_3^- PCl_5 F_3^+

12. What do the molecules that you crossed out in question 11 have in common? Why can't they exist?

13. What are the two main factors that determine lattice energy? Which of our periodic trends is most useful here? Which of the two makes the greater contribution to differences in lattice energy observed in different salts?

14. Rank the following sets of salts from least to greatest lattice energy.

a. LiF, CsBr, KCl

b. CaO, AlN, KI

c. Na_2S, RbI, MgO, Al_2S_3

d. NaClO, $NaClO_3$, $NaClO_4$, $NaClO_2$

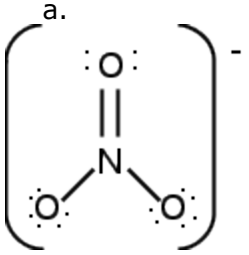
15. Calculate the difference in electronegative (ΔEN) for the following diatomic species. Approximations are fine.

a. LiH
b. BeO
c. HF
d. BN
e. LiF

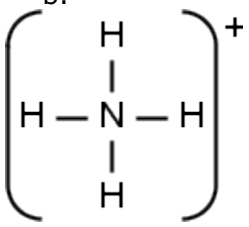
16. Rank the following species from lowest to highest ΔEN: IBr, ClI, IF, F_2, BrF

17. Assign formal charges to each atom in the following species.

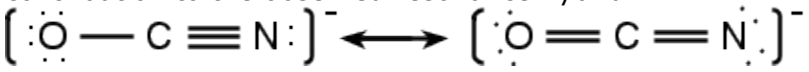
a.



b.



18. Consider the two resonance structures of cyanate below. Which makes the greater contribution to the observed resonance hybrid?



19. What is the proportionality between...

a. ΔEN and bond energy?

b. ΔEN and bond length?

c. bond energy and bond length?

20. Rank the following species from (_____): IBr, ClI, IF, F_2, BrF
a. greatest to least bond energy

b. shortest to longest bond length