Name _____ Test 1 (10/5)
CHEM 0211 (Adv. Inorganic) Fall 2015

1. a. (2 pts.) According to current theories on the universe, most of the subatomic particles, hydrogen nuclei, and helium nuclei were formed shortly after what event? 1. _____

2. _____

b. (4 pts.) Where, and by what nuclear process, are hydrogen and helium nuclei converted to nuclei larger than Li.

3. _____

4. _____

c. (4 pts.) Nuclei heavier the iron nucleus are not made by the process used in part b. How and where are nuclei heavier than iron formed. 5. _____

6. _____

7. _____

8. _____

2. (6 pts) a. Write the atomic symbols for beryllium-8 and helium-4.

9. _____

10. _____

b. (4 pts.) When beryllium-8 reacts with helium-4, what nucleus forms? Write the symbol for the atom.

11. _____

c. (6 pts.) Using the information from a and b, write the nuclear reaction where beryllium-8 and helium-4 are combined to form the new element.

3. a. (5 pts.) Bohr's model for an atom treated an electron as what?

b. (5 pts.) Quantum mechanics models an electron in an atom as what?

4. (10 pts.) Rutherford's famous gold foil experiment established what fact about atomic structure, explain.

5. a. (6 pts.) Match the definition with the correct term.

siderophile	"Copper loving" combines with sulfur, selenium and arsenic
chalcophile	"Iron loving" combines with metals like iron
lithophile	"Rock loving" combines with oxygen and halogens.

b. (6 pts.) If you were looking for "iron-loving" elements, would you expect to find them in the Earth's core? Explain, briefly.

6. (10 pts.) List the l, m_l, and n values for an electron in each of the following orbitals. If more than one set of quantum number can be used to describe the electron, list them all.

a. an electron in a 2s orbital

b. an electron in a 3p orbital

7. (16 pts.) Draw Lewis structures for the following molecules.

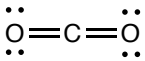
a. ClO_4^-

b. SF_4

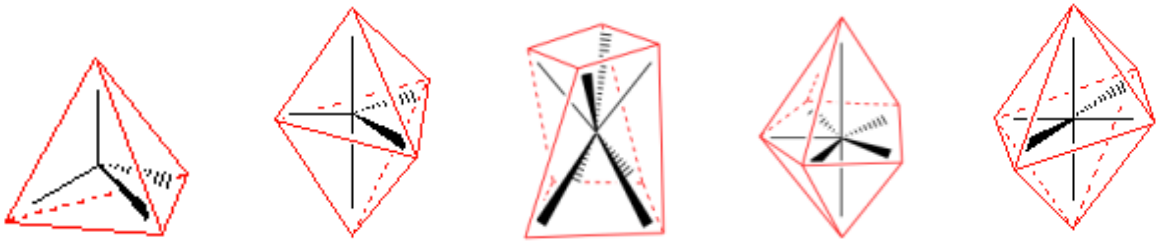
8. a. As one proceeds from B to C to N, the amount of energy required to remove an e^- from the atoms increases. Explain this observation.

b. On the other hand, as one goes from N to O, the amount of energy required to remove an e^- from the atoms decreases. Explain this observation.

9. a. (4 pts.) Draw resonance structures for the molecule that is drawn below.
b. (4 pts.) Calculate the formal charges for the atoms (label all atoms, even those with a 0 formal charge).
c. (2 pts.) Rank the structures from lowest (#1) to highest (#2, #3, etc.) energy.



10. (12 pts.) Some possible arrangements for bonds around a central atom are drawn below. Label each drawing with the appropriate name: tetrahedral, square antiprismatic, pyramidal, bent, v-shaped, trigonal bipyramidal, trigonal planar, pentagonal bipyramidal, octahedral, see-saw, T-shaped.



11. (12 pts.) In comparison to the repulsion between pairs of electrons in nonpolar σ bonds, explain how the following features affect the bond angles in a molecule. That is, consider a C–H bond and (i) describe whether the item listed below would require more or less space than a C–H bond, and (ii) describe what the feature would do to other bond angles in the molecule; in other words, would the bonds angles be larger or small than "ideal".

a. lone pair electrons

b. π bonds

c. bonds to electronegative atoms