

1. a. (4 pts.) According to current theories on nucleogenesis, shortly after what event were most of the subatomic particles, hydrogen nuclei, and helium nuclei formed? 1. _____

2. _____

b. (4 pts.) Where, and by what process, are hydrogen and helium nuclei converted to larger nuclei. 3. _____

4. _____

5. _____

c. (4 pts.) Are all heavy nuclei made by the process used in part b? Explain briefly. 6. _____

7. _____

8. _____

9. _____

2. (10 pts.) List the l , m_l , and n values for an electron in each of the following orbitals. If more than one n , l , or m_l quantum number can be used to describe the electron, list them all. 10. _____

a. an e^- in a 3s orbital

b. an electron in a 6p orbital

3. 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 “rock-loving” elements, would you expect to find them in the Earth’s core? Explain, briefly.

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

5. When an e^- is added to a B atom, energy is released, and when an e^- is added to an C atom, slightly more energy is released. On the other hand, energy is not released when one attempts to add an electron to a N atom.

a. (6 pts.) Using ideas like nuclear charge, electron configuration, and others, explain why more energy is released when an electron is added to C as compared to B.

b. (6 pts.) Using ideas like nuclear charge, electron configuration, and others, explain why more energy is not released when an electron is added to a N atom even though a N atom has a more positive nucleus than a C atom.

6. (16 pts.) Draw Lewis structures for the following molecules.

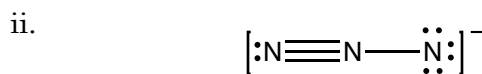
a. N_2O

b. Cl_3PO

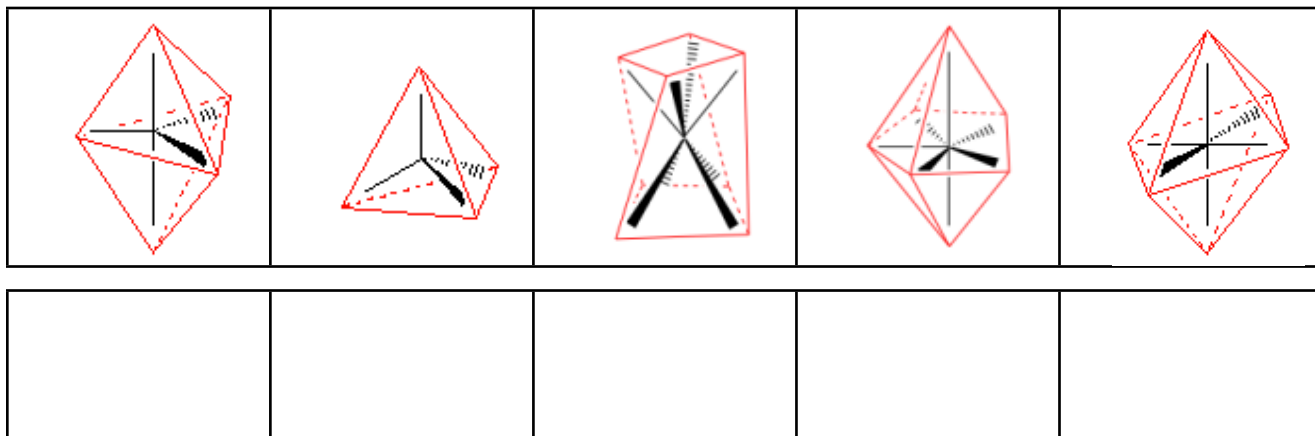
7. a. (8 pts.) Draw resonance structures for the two molecules that are drawn below.



b. (4 pts.) For i and only i calculate the formal charges for the atoms.

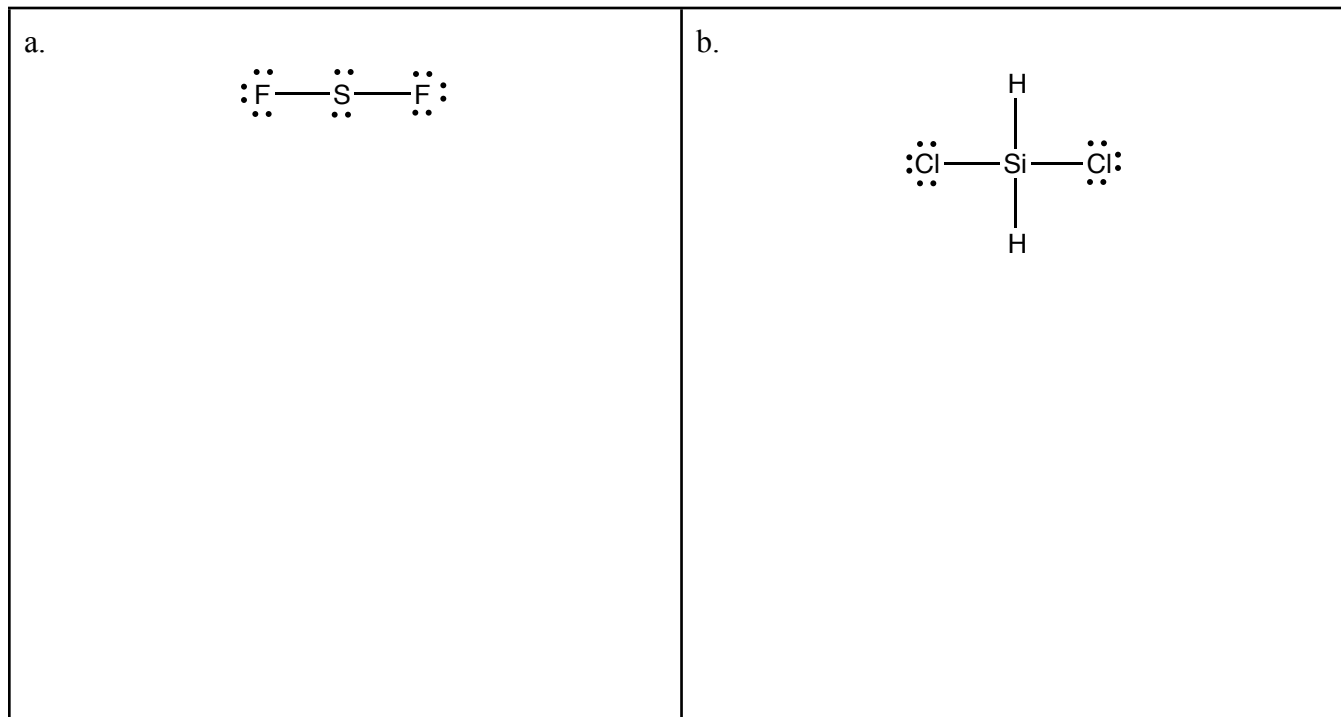
c. (4 pts.) for i and only i Rank the structures from lowest (#1) to highest (#2, #3, etc.) energy.



8. (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.



9. (12 pts.) Lewis structures for two molecules have been provided below. Draw a three-dimensional representations (wedge  and dash ) of the molecules and determine whether the molecule is polar. If you determine that the a molecule is polar, indicate which are the positive and negative sides of the molecule. If you cannot determine whether the polarity of the molecule, explain why you can't.



10. (12 pts.) In comparison to the repulsion between pairs of electrons in nonpolar σ bonds, explain how the following features effect the structure of a molecule.

a. lone pair electrons

b. π bonds

c. bonds to electronegative atoms