Review - Electron Configuration and Bonding

- Principal energy level vs. sublevels (orbitals)
- Electron configurations for any element (except those requiring f orbitals)
- Structure of the Periodic table and how it relates to orbital filling
- Valence electrons
    - What is most stable
    - Their significance in bonding (forming charges or covalent bonds)
    - Relationship between the following periodic properties:
        - Electronegativity, ion formation, ionization energy, atomic size
- Strong (covalent and ionic) vs. weak bonds (van der Waals)
- Covalent vs. ionic bond and the relationship to electronegativity
- Polar covalent vs. non-polar covalent bonds.
- Structure of ionic and molecular substances
- Predict simple ionic formulas.
- Lewis dot diagrams and bond diagrams (structural formulas)
- Be able to make some predictions about molecular shapes based on single vs. double bonds and the lone pairs of electrons.
- Be able to predict some properties of substances based upon their underlying atomic structure and types of bonds.

Example Questions and Problems:

1) Give the long and shortcut electron configurations for the following elements: S, Ag, and I.
2) What are valence electrons? Underline them in the electron configurations from question one.
3) List at least three things that are true about elements which are in the same column of the periodic table.
4) Explain the terms electronegativity, ionization energy, and atomic radius.
5) Explain why it is harder to remove an electron from chlorine than it is for sodium? (Talk about ionization energy, atomic radius, and the most stable number of valence electrons.)
6) What kind of compound will form if sodium and chlorine react with each other: ionic or covalent? Why?
7) How is the structure of ionic compounds different from molecular compounds. (In other words, if you had to draw an atomic level picture of an ionic compound - NaCl, how would it differ from the atomic level picture of a molecular compound like CH_4?)
8 Explain why oxygen will form two covalent bonds when sharing electrons or a negative two charge when forming an ion?

(over)

9) Give an example of an element that will form a covalent bond with oxygen and an element that will form an ionic bond with oxygen. Explain why these elements bond to oxygen in this way.

10) Why do elements that are in the same column have similar chemical properties?

11) For each of the following formulas do the following:

a) lewis dot diagram

b) structural formula

c) 3D sketch of the molecule's shape

SiH_4 C_2H_6 C_2H_4S (two ways) CH_2NP

12) What are van der Waals bonds? Explain how they form.

13) Give one example of how van der Waals bonds affect the properties of a substance.