Unit 2: Atomic Structure and Properties

Part 1

1. Explain and describe the early models of the atom, experimental work, evidence, inferences and weakness associated with these early models (i.e. with particular emphasis on Thomson, Rutherford and Bohr).

2. The study of electromagnetic radiation (light) provided some insight as to where electrons are located. Be able to describe characteristics of light (i.e frequency, wavelength and energy) and solve light calculations using proper units.

3. Describe the current quantum mechanical model of the atom, including explanations of the four quantum numbers.

4. Write ground state electron configurations for elements using the Pauli exclusion principle and Hund's rule. You should also be able to identify an element based on its ground state configuration.

- Pauli principle: no two atoms can have the same four quantum numbers. The maximum of 2 electrons can occupy a single orbital.

- Hund's rule: the most stable arrangement of electrons is that with the maximum number of unpaired electrons, all with the same spin direction (makes total energy of the atom as low as possible).

5. Express electron configurations in short form (using noble gas) and energy level diagrams for neutral atoms and anions and cations.

6. Relate an element's electronic configuration to it's position in the periodic table.

Part 2

7. Review trends in the periodic table. Define of ionic and covalent bonds (polar and non-polar) and predict type of bond present using difference in electronegativies.

8. Draw Lewis structures for various atoms, molecules and polyatomic ions. Be able to relate electron configuration of atoms to thier Lewis dot diagram.

9. Define and draw ions/molecules that exhibit resonance.

10. Valence Bond Theory. Show how covalent bonds form from the overlaping of orbitals. (simple molecules only)

11. Define VSEPR theory and use this theory to predict the shape of simple

molecules and molecules with multiple bonds.

11. Distinguish between intramolecular forces and intermolecular forces and relate these to the differences between physical and chemical properties of a substance.

12. Explain the following intermolecular attractions: Van der Waals forces,Dipole-Dipole, London Forces, Hydrogen bonding. Compare the relative strength of these bonding forces. Be sure to explain the effect of increasing # of electrons in a compound and the effect of hydrogen bonding on boiling point.

13. Describe the properties of various crytalline solids (ionic, metallic, covalent network, molecular). Be able to classify each based on molecular formula and lab analysis.