CHM 101 A
Preparation for Exam 3 (Ch. 7, 8, and 9)
Fall 2006

1. Describe the properties of electromagnetic radiation. Know relative values of wavelength, frequency and energy for the visible region. Know where ultraviolet and infrared radiation fall relative to the visible region.
2. Calculate wavelength, frequency, or photon energy when given one of these values for a type of radiation.
3. Describe how atomic line spectra are produced, and explain the role of atomic line spectra in the development of the modern model of the atom. Relate the energy change during an electron transition to the type of light emitted (or absorbed).
4. What is an orbital? Describe the general shapes of the *s*, *p*, and *d* orbitals.
5. Describe the distribution of electrons in the ground state of an atom in terms of filled *orbitals, sublevels* and principle energy levels. Know the number of orbitals in each different type of sublevel. Determine the number of *unpaired* electrons for any atom.
6. Write the notation for the complete and abbreviated electron configuration of any atom or monatomic ion (through xenon).
7. Determine the number of valence electrons for any main group element, molecule or ion.
8. Describe and explain periodic trends in atomic radius.
9. Define ionization energy. Describe and explain periodic trends in ionization energy. Relate first ionization energies to relative reactivities, such as the reactivities of the alkali metals with water. How does the trend in successive ionization energies relate to the number of valence electrons?
10. Write Lewis electron dot structures for covalent molecules and ions. Describe the bonding in terms of single, double, or triple bonds, and number of nonbonding (unshared) electron pairs. Explain the physical origin of the *Octet Rule*.
11. Write appropriate "resonance structures" for a molecules or ions such as SO_2, NO_3^- or CO_3^{2-}, and explain their physical meaning. Determine the number of equivalent resonance structures that should be used to best describe the actual molecule or polyatomic ion
12. Explain the meaning of electronegativity, and predict the relative electric charge distribution in a bond on the basis of the locations of the two elements in the periodic table.
13. Distinguish between nonpolar covalent, polar covalent, and/or ionic bonding in terms of electronegativity differences. Use partial positive ($\delta+$) and partial negative ($\delta-$) signs to describe the electron distribution in a polar bond.
14. Rank a set of bonds in order of increasing bond polarity.
15. Predict the parent structure, molecular shape, and approximate bond angles for a molecule or polyatomic ion.
16. Use bond polarity and molecular structure to distinguish between polar and nonpolar molecules.
17. Use the appropriate gas laws to calculate changes in pressure, temperature, volume, and moles.
18. Use the ideal gas law to calculate P, V, T, or n (or mass). Convert to appropriate units when needed.
19. Describe how changes in P, V, T, n, will affect the density of a gas.
20. Describe gas behavior (changes in pressure, volume, etc.) in terms of changes at the molecular level. Describe the dependence of average kinetic energy on absolute temperature. Predict relative molecular velocities using the relationship $KE_{ave}=\frac{1}{2}\, m(v_{ave})^2$.