Chemistry 101   Final Exam Guide for Chem 101 (DO NOT LIMIT YOUR REVIEW TO THESE QUESTIONS.) **Bring a scantron for the final exam. Come on time 8:00am sharp! If you are late, you will lose precious time for part I of the test which will be turned in by 8:30 am sharp.**
The 200 pt test is on Monday, March 16,2009 at 8-10:30 am. The final exam is **cumulative** and will assume you have reviewed chapters 1-8 with greater emphasis placed on material after chapter 6. Roughly 50% (i.e. 100 points) will deal with material covered in the first two midterms. And the rest will be on chapters 7 and 8.

For chapters 1-6, please refer also to the review guides for those two exams. Go over those exams as part of your review. As before, we will skip the sections involving oxidation-reduction reactions, and leave that for Chem 103. We will also skip Molecular Orbital Theory and leave that for next quarter.

Chapt 7. Quantum Theory:
a) Do calculations involving photon energy, frequency and wavelength for electromagnetic radiation.
b) Do calculations involving the energy levels of the hydrogen atom. What is the balmer series and how is it different from the Lyman and Paschen series?
c) Know the rules for allowable quantum numbers of the electron's wave function.
d) Be able to write the electron configuration of elements and their ions (also using core notation).
e) Be able to explain the periodic trends of: atomic radii, ionic radii, electron affinity, ionization potential and electronegativity.
f) Be able to explain the significance of: photoelectric effect, uncertainty principle, de Broglie wavelength, Pauli Exclusion principle, Hund's Rule, valence electrons.

Chapt 8. Covalent Bonding:
a) Be able to draw the Lewis structure for a molecule. Know the rules for drawing Lewis structures. Know the octet rule. Practice, practice, practice (there are many examples in the book which you should try). Then compare your structure with the one given in the book so you can sharpen your skills.
b) Isomers: Know about the various types of isomers possible such as geometric isomers (cis, trans), optical isomers (mirror images) , structural isomers.
c) ΔH from BE: Use bond enthalpies to determine the enthalpy of reaction.
d) Know how to determine <u>formal charge</u> to differentiate between possible Lewis structures.
e) Know: resonance structures, cyclic structures.
f) Know common exceptions to the octet rule.
g) Know about bond polarity and electronegativity.
Below are some practice review questions. Be able to do <u>all</u> homework in chapt 8.
1) An acidic compound composed of 2.1%H, 29.8% N and 68.1% O has a molecular mass of 47 g/mol.a) What is the empirical formula of the compound? b) What is the name of the compound? c) What is the Lewis structure if H is bonded to O? d) Give the formal charge of nitrogen and oxygen in the molecule.
2) Explain the periodic trends: atomic radii, ionization energy, electron affinity. Explain "anomalies" in the ionization energy (IE) trend involving 2nd row elements. For example, a) Using "box" notation, draw the occupied orbitals of neutral vanadium (V). How many unpaired electrons is in V? b) <u>Explain</u> why nitrogen has a higher first ionization energy than oxygen. <u>Explain</u> why it has a higher first ionization energy than carbon.

3) Periodic (and otherwise)trends: Arrange following in order of

a) increasing size: Ar, S^{2-}, K^{2+},
b) increasing ionization energy: F, S, Al, He
c) increasing electronegativity: Se, Ne, O
d) bond polarity: H-O, C-C, N-O, C-F .

4) Describe or explain scientic contributions made by Dalton, Mendeleev, Planck, Einstein, Thomson, Bohr, Schrodinger, de Broglie, Pauli, Hund & Heisenberg in our modern understanding of the atom. What is the wavelength of a proton (1.67×10^{-27} kg) travelling at 1.2×10^{5} m/s?

5) The energy required to convert O_2 molecules to O atoms is 496 kJ/mol. If electronic radiation of 180 nm is absorbed by 1 mole of O_2 molecules, how much kinetic energy will be present in the resulting individual O atoms? What is the maximum wavelength that photons are required to have to "split" O_2 molecules into two O atoms? Is it in the UV, visible or IR range of wavelengths?

6) a) Name the following when pure and when in an aqueous solution: i) $HClO_3$, ii) $HClO_2$, & iii) H_2S : Draw their Lewis structures and identify polar bonds if any.
b) Name the compounds: K_3PO_4 ; $BaCl_2$; Give the formulas for aluminum dichromate, magnesium phosphate

7) Give the number of electrons, protons and neutrons in: ferrous ion; mercuric ion or $^{195}_{78}Pt^{4+}$. Write down the corresponding electron configurations for this ion.

don't forget to review previous chapters!
Review chapter 1-6 also! For example: Titration problems, calorimetry problems, enthalpy (ΔH) problems, density, temperature conversions, unit conversion, atomic theory, stoichiometric problems, writing balanced equations, writing and naming molecules and ionic compounds, empirical formula determination using % composition, to name some of the important ones that you will be tested on.