Study Guide for Exam Two

For Exam two, you will need

- a non-programmable, non-graphing calculator (You will NOT be allowed to share or borrow a calculator or use a cell phone for a calculator during the exam.)
- a #2 pencil
- a scantron (like the one for Exam 1)

Exam 2 Protocol:

- Read each question and the directions carefully. The directions may change from problem to problem.
- If you don't know how to do a problem, skip it and move on. Careful of the time. Some of the multiple-choice questions will be worth only a few points but could take a while. Try to do the big point problems that you know how to do first.
- Be sure any work you do is clear and easy to follow. I am not a mind reader.
- Follow all of the rules of significant figures and label all answers with the appropriate units.
- Look at the posted equation sheet and constants to see what will be given.

Exam 2 will primarily cover section chapter 17 (section 7), chapter 7 and 8 (sections 2-8), any problems assigned from those chapters (including worksheets) and anything covered in lecture. The exam will consist of multiple-choice questions, some true-false questions, some short answer questions, and some problems. etc. Don't ask me too many specific questions because I haven't written the exam yet!

What should you know from Chapters 1-5? (You should already be familiar with this stuff and should not require any review.)

- Conversion from one metric unit to another (g to mg, m to km, etc)
- Conversion from English to Metric given conversion factor
- Basic Chemical Nomenclature (what is formula for sodium chloride? Carbon dioxide?)
- Traits of different states of matter (solid, liquid, gas)
- Components of Matter (Compounds, elements, atoms, ions, electrons, protons, neutrons, isotopes)
- Translating & Balancing Chemical Equations – this includes being able to predict products for types of reactions like in the lab
- Using Chemical Equations to do Stoichiometry (given this reaction, X grams of reactant Y makes how many grams of product Z?)
- Recognizing simple reaction types (metathesis, displacement, combination, decomposition, etc.)
- Knowing & Using the Ideal Gas Law PV = nRT

What should you know from Chapter 17? (Most of the material from Ch. 17 was on Exam 1, but since ΔG is on Exam 2, you need to be familiar with some of this older material.)

- What does it mean if something is spontaneous?
- Two ways we can determine if a reaction is spontaneous or not (one in terms of the universe, one in terms of the system)
- Gibbs Free Energy – what it means, what it tells us ($\Delta G = \Delta H - T\Delta S$), what is the sign on ΔG of a spontaneous process?
- How to calculate the temperature where a reaction will switch from spontaneous to non-spontaneous or vice-versa
- Be able to predict the sign on ΔG, given sign on ΔH and ΔS and determine if the temperature has any effect on spontaneity
- What does it mean to be enthalpy-driven? Entropy-driven?
- Be able to calculate ΔG using values from a table for ΔH and ΔS and then using $\Delta G = \Delta H - T\Delta S$.
- Calculate $\Delta G_{rxn} = \Sigma\ m\ \Delta G_f^o$ (products) - $\Sigma\ n\ \Delta G_f^o$ (reactants)
- Know which values of $\Delta H_f°$, S^o, and $\Delta G_f°$ are zero for what substances

What should you know from Chapter 7?

- Key variables associated with light and how to calculate them or use them (frequency, wavelength, energy, and amplitude) $c = \lambda\nu$
- Know the visible region of the electromagnetic spectrum and the placement of the different ends of the visible region and how that relates to relative energy, wavelength, and frequency
- The differences between constructive and destructive interference. Know what diffraction is.
- Light as a particle in terms of photons or energy packets $E = h\nu$ or $E = hc/\lambda$
- Photoelectric effect: what it is and how to how to calculate stuff related to the photon, the workfunction or binding energy, or the speed of the ejected electron. Understand what the binding energy or workfunction represents.
- Understand atomic spectra and how and when to use the Rydberg equation or the Bohr equation. Why are there discrete lines in the emission spectrum?
- The Bohr model of the atom including the spacing of the levels as n get larger and the other key components to Bohr's model of the atom.
- How to calculate initial or final energy levels, energy of photons, etc. as an atom either absorbs or emits a photon. How does ΔE_{atom} relate to E_{photon} for absorption or emission?
- Idea of matter as wave (what equation, what variables) and why don't we see the wave behavior or certain objects
- Heisenberg Uncertainty Principle – when is it important, what equation, what variables
- Quantum Mechanical Model of Atom – what it tells us, what does Ψ^2 tell us
- What are atomic orbitals and what do you need to define an atomic orbital? How many orbitals in a given energy level?
- The four quantum numbers. What they tell us, what values they can have, their symbols, and official names. How many orbitals are in a given n level? What are the different shapes of the sublevels?

What should you know from Chapter 8?

- The four quantum numbers. What they tell us, what values they can have, their symbols, and official names.
- Pauli exclusion principle, Hund's rule and the aufbau principle - You should be able to match up the idea with the name in this case
- What quantum numbers are needed to define an orbital? Define an electron's location?
- What affects the energy of an orbital? Can you rank the orbitals from lowest to highest in energy? What is shielding? What is Z_{eff}?
- Can you do electron configurations for every element (and ion) on the periodic table, including the long, condensed, and box diagram methods? Don't forget the exceptions!
- The types of electrons (core and valence) and how to determine how many there are in a given atom.
- Determine the electron configurations of ions and transition metal ions and what it means to be isoelectronic
- Know how to tell if something is paramagnetic or diamagnetic and what each of those terms mean.
- Periodic trends – atomic size, ionization energy, electron affinity, metallic character or behavior, and ion size. Know what each term means (this means the **technical** definition, an equation if it is an energy, a picture if it is a radius) and what happens to each as you move down a group, or across a period. Know why.

What should you know from the labs?

- How to use a calibration graph to convert a scale reading to wavelength
- How to determine the energy of the various transitions
- How to determine the wavelength of the various transitions

You should also be familiar with the material from Exam 1. It can show up on this exam as well. However, if any material from Exam 1 shows up on this exam, you can count on it being a significant topic and something you probably know since you have done many problems of that type. I won't bring back minor details from Exam 1 to test you on Exam 2. We have done an example in class that used material from Exam 1 as part of the example. That would be a good example of just what might be expected of your previous knowledge from Exam 1.

This list may not include everything. The best way to study is to practice, practice, and practice. Do problems on the worksheets and the homework. Read over your notes and your text for the concepts. Come see me if you have questions and need help. Good luck with the studying.