Exam 4 Review Sheet for Monday, May 3 Exam
Chem 1120, Spring 2004, Robertson

Our exam will include material from parts of **chapters 20, 21, 24, and 15**. **Only material that I have covered in class, have assigned homework problems for or is mentioned on this review sheet will be tested.** Material from previous tests is also fair game, but will be given limited coverage. This exam will be somewhat different in that there will be a substantial number of multiple choice questions. On Monday, you should be able to:

Chapter 20 - Thermodynamics

- Explain the idea of reaction spontaneity from a chemical viewpoint and apply the 2nd law to practical phenomena.
- Predict what the entropy change (+ or -) would be for a given reaction. Predict what the entropy change for the surroundings would be.
- Write the definition of G and use the expression for ΔG at constant T & P ($\Delta G = \Delta H - T\Delta S$) to answer practical questions. Explain what ΔG measures.
- Predict under various conditions of ΔH and ΔS whether a reaction will be spontaneous. Find the temperature at which a reaction may go from spontaneous to non-spontaneous ($\Delta G = 0$)

Chapter 21 - You will be given a table of reduction potentials - Electrochemistry

- Define and identify oxidation and reduction, oxidizing agent and reducing agent in a redox reaction.
- Balance redox reactions in acid, base, and neutral conditions using the half cell method. Give practical examples of redox reactions.
- Diagram a voltaic cell and identify and define the anode and cathode. Explain what the polarity of these electrodes are. Explain the operation of a salt bridge.
- Define and explain electrical voltage. Relate cell potential to the Gibbs Free Energy change. Calculate ΔG if E is known and vice versa. Explain the significance of ΔG with regard to reaction spontaneity.
- Use the table of half cell potentials to predict the spontaneity of a reaction and the E° of a voltaic cell using the relationship $E^\circ = E_{ox} + E_{red.}$
- Calculate the E of a cell at nonstandard conditions using the Nernst Equation.
- Use the E° to find the equilibrium constant and vice versa.
- Be able to identify the chemical reactions for the dry cell, alkaline, lead storage, and nickel-cadmium batteries. Do not memorize, merely be able to recognize the reactions. Give advantages and disadvantages of each.
- Be able to explain the operation and applications of a fuel cell and give half-cell reactions for the hydrogen/oxygen fuel cell.
- Define, explain and discuss the corrosion process and possible solutions. Be able to recognize the half cell reactions for iron.
- Define and contrast electrolysis with voltaic cells. List the major applications of electrolysis and be able to predict the products of electrolysis. Calculate the amount of material deposited at the anode or cathode. Solve for any of the variables in the equation $m = MIt/nF$.

Chapter 24 - Nuclear

- Define radioactivity.
- Write nuclear equations for alpha, beta, positron, and electron capture processes. Describe alpha, beta, and gamma radiation as to speed and penetrating power.
- List and define units of radioactivity.
- List and describe the effects of radioactivity.
- Explain what holds the nucleus together in terms of one of the 4 fundamental forces. Calculate the binding energy per nucleon for any nuclide.
- Write nuclear equations for transmutations, fission, and fusion processes. Calculate the energy given off in a radioactive process or transmutation.
- Discuss and give examples of the various health applications of radioisotopes.

Chapter 15 - Organic

- Define and use the following terms: catenation, hybridization, homologous, saturated, unsaturated, condensed structural formula, general structural formula, radicals, isomers.
- Explain why there are so many carbon compounds.
- List and explain the different types of hybridization that carbon undergoes and what geometries and bond angles result.
- Name and draw structural formulas for alkanes, alkenes, alkynes and aromatics. Be sure and know common names for structures covered in class. Describe the general properties of each type of compound with regard to stable phase under normal room conditions, water solubility, and chemical reactivity.