

Exam 4 Review Sheet for Monday, April 30 Exam Chem 1120, Spring 2000, Robertson

Our exam will include material from parts of **chapters 19, 20, and 21**. **Only material that I have covered in class, have assigned homework problems for or is mentioned on this review sheet will be tested.** The answers to all problems in the chapters are on reserve in the library. 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 problems. On Monday, you should be able to:

Chapter 19 – Buffers, Titrations, K_{sp}

- Explain the operation of a buffer. Derive the Henderson Hasselbach equation and use it to find the pH of a buffer, this includes the initial composition of the buffer as well as the pH after strong acid or strong base is added.
- Define and explain the titration process. Sketch the general shape of an acid/base titration curve. Find the equivalence point of an acid/base titration. Find the pH before, at, and beyond the equivalence point. Predict what indicator should be used in an acid/base titration.
- Write the expression for K_{sp}. Be able to: find the K_{sp} from solubility, find the solubility from K_{sp} (even with common ions), determine whether precipitation will occur when solutions are mixed together

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. 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 $E^\circ = E_{\text{ox}} + E_{\text{red}}$.
- 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. Know the half cell reactions.
- 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 $m = MIt/nF$.