Chem 116 - Section 1
Spring, 2007
Study Guide for Test II

The test will be given during regular class time on Wednesday, April 11. When you come to class, please take alternate seating (i.e., every other seat and every other row) to the extent possible. Bring your calculator (with extra batteries, if needed), several sharp pencils (or a mechanical pencil with extra leads), and erasers. Do not use colored pencil or pen. *Nothing else is permitted during the test*. **Do not cheat!**

The test will cover the lecture material corresponding to the assigned sections of chapters 14 and 15. It will consist of questions and problems similar to those assigned for homework and given as examples in class. The test consists of seven pages, including the cover page. The following information will appear on the cover of the test.

$R = 0.08206\ \text{L·atm/K·mol} = 8.314\ \text{J/K·mol}$ $\quad \text{K} = {}^{o}\text{C} + 273$ $\quad K_p = K_c(RT)^{\Delta n}$ $\quad t_{½} = 0.693/k$

You will also receive a loose copy of the periodic table, which you may use for any question. Use the back of it for scratch paper, if you need it. However, if you mark on it, throw it away at the end of the test period. If it is unmarked, turn it in, and we will use it again.

The test itself consists of the following five sections.

1. (20 points; 4 points each part) Circle the correct answer to each of the following. Multiple choice questions dealing with the basic definition of *Rate*, first-order half-life, relationship between half-life and *k* for a first-order reaction, integrated rate-law expression for a first-order reaction, and the Arrhenius equation. Two of the five questions involve straightforward calculations.

2. (16 points) A four-part question dealing with a given equilibrium. Given starting amounts of a reactant or product, and the equilibrium value of one of the species, determine the changes in concentrations and final concentrations of all species at their equilibrium. Then, calculate K_c or K_p for the reaction, and predict the effects of certain stresses on the position of the equilibrium. This question is similar to assigned problems 15.31 and 15.33, and deals with Le Chatelier's Principle, like assigned problems 15.51 and 15.53.

3. (24 points) Given a gas-phase reaction and the value of its equilibrium constant, *K*, consider a mixture of certain quantities of reactants and products. After predicting in which direction the system must proceed to reach equilibrium, calculate the concentrations of all species once equilibrium is achieved. Be sure you can do problems like 15.43, 15.47, 15.49, 15.74, and similar problems given as examples in class. Pay particular attention to incorporate the stoichiometry of the reaction when setting up the algebraic expressions for the equilibrium concentrations.

4. (20 points) Given a reaction, its proposed mechanism, and the reaction profile for the mechanism, answer four qualitative questions about the identity of various species, the rate laws for each step, and the overall rate law that should be observed on the basis of the proposed mechanism.

5. (20 points) Given some kinetic data for a hypothetical reaction, determine the rate law expression for the reaction and calculate the value of the rate constant, *k*, with the appropriate units.

BONUS (5 points) Given a proposed mechanism for the reaction in problem 5, show that it is consistent with the experimentally determined rate law expression. Your derived expression must be cast only in terms of observable reactant species, not reaction intermediates.