The final exam will be comprehensive. The new material is the last half of 9.4 – 10.4. If you combine this review sheet with the review sheets for exams 1 – 3, then you will have a review for the entire semester. You will be provided with all of the same information that you were given with exam 3. In addition, you may bring two 3" × 5" index cards with whatever information you wish hand written on both sides. You should expect the exam to take about 2 hours and you will need a scientific calculator. There will be a mixture of long answer questions and shorter questions such as multiple choice and true/false. Below is a list of topics for review starting at the end of the exam 3 material; however, this is just a guide for studying. Anything that was discussed in class or in the textbook could be on the exam. Pay special attention to homework assignments, in class examples, and the end of chapter problems.

Know the definition of half-life, and be able to determine the half-life of a reaction given an initial reactant concentration. Know how to determine the order of a reaction by measuring the half-life at two different initial reactant concentrations.  
Know what the differential method of determining reaction orders is.  
Understand how the rate constant can be determined for a reaction in which the forward and reverse reactions are at equilibrium.  
Understand the general principles behind stopped flow and pulse techniques for studying kinetics and understand why these types of technique are sometimes necessary.  
Understand the difference between elementary reactions and composite reactions and know the definition of a reaction mechanism. Know the meaning of the term *molecularity*.  
Know what a catalyst is and how it speeds up a reaction. Understand the definition of activation energy.  
Know the Arrhenius equation and understand what an Arrhenius plot is and what it may be used for.  
Understand what a transition state and an activated complex are.  
Know what is shown on a potential energy surface (PES) and understand how a PES can be used to determine the reaction pathway for a reaction. Know the difference between attractive and repulsive potential energy surfaces and know which is a associated with a stripping mechanism and which with a rebound mechanism. Also understand the difference between these two types of mechanisms.  
Be able to rationalize or estimate the Arrhenius constant in terms of hard-sphere collision theory. You will be given any relevant equations if you need them, but you should have a good qualitative understanding of the theory.  
Know the general idea behind transition state theory and what it accounts for that the hard-sphere collision theory ignores in estimating the Arrhenius constant.  
Understand what happens in quantum mechanical tunneling and how this changes the apparent activation energy for a reaction. Know what quantum mechanical tunneling would look like on an Arrhenius plot.  
Understand the kinetic isotope effect. Have a general idea of why heavier isotopes react more slowly than lighter ones.  
Know several reasons why reactions in solution may not have the rates that would be expected if the reactions were in the gas phase.  
Understand how ionic strength affects the rate constant relative to the rate constant in an ideal solution.  
Know what is studied in the discipline of reaction dynamics.  
Understand how a crossed molecular beams experiment works and how this can be used to understand reaction dynamics.  
Understand how chemiluminescence is used to study reaction dynamics.  
Be able to write expressions for the change in concentration over time of a reactant, product or intermediate in a reaction mechanism.  
Understand that mechanisms can never be shown to be absolutely correct. They can be disproven but not proven. Understand the different ways to identify whether a reaction has a composite mechanism. Also understand the concepts of simultaneous (parallel) reactions, opposing reactions, consecutive reactions, and feedback. See the handout on these points.  
Understand the steady state approximation and know what an induction period is. Also be able to apply the steady state approximation to determining the expression for the rate law of a reaction if you are given a potential mechanism.  
Know the definition of the rate controlling (limiting or determining) step (RDS) of a reaction. Be able to use this concept to simplify the determination of a rate law via the steady state approximation.  
Know how rate constants for elementary reactions are connected to equilibrium constants for a system that is at equilibrium. Be able to use equilibrium constants as part of your steady state treatment of the rate law if necessary.