CHEM 3410, Review Sheet for Test

This study aid is, of course, *NOT all inclusive*. Its goal is to give you a starting point from which to study. Information that you will have at your disposal:

Periodic table, scratch paper, various information such as ΔH and ΔS tables, etc. that are necessary

Material on tests:

Remainder of Ch. 3, Kinetics (class notes, ch. 22 in our textbook)

The make-up of the test: short-answer, discussion, short and long problems (no multi-match)

The outline follows the chapter material as well as the notes. There were some things in the book that we didn't discuss. Thus, "NR" means that you're not responsible for the material directly after this phrase in parenthesis.

Remainder of Ch. 3

Chapter 3
Don't forget that the instructions for both exercises and problems say to assume that all gases are perfect and that the thermochemical data are for 298.15 K unless otherwise stated.

Exercises: 10, 11, 12, 14

3.6 Standard Reaction Gibbs energies
- Calculating Gibbs
  - Direct method
    - Indirect method

$$\Delta G = \Delta H - T\Delta S$$

$$w_{add,\max} = \Delta G$$

Chapter 22 (Kinetics) Outline for Test Preparation

Suggested HW problems from the book:
Chapter 22
Exercises: 1, 2, 3, 4, 5, 6, 7, 9, 11, 12b, and 14
Problems: 1 (It's in the class notes on p. 15.), 2, 5, 35 (work like we did in class and not the soln's manual)

Practical application: Why study kinetics?
22.1 Experimental techniques (class notes, lab material)
- Three variables to monitor (p. 3 of class notes)
- Spectroscopic methods (from kinetics lab)
  - Beer's law
  - Sources of experimental error

22.2 The rates of reactions
- rate expression
  - instantaneous rate expressions vs. average rate expressions
- rate law
  - order of reaction
    - How to determine (only through experimental data!)
    - certain types of reactions are always a certain order. Know these!
  - pseudo order of reaction
  - order of reactants
  - rate constant
  - pseudo rate constant
  - How to find the rate law
    - isolation method (Genchem method)
    - integrated rate laws (pchem method)
- units

22.3 Integrated rate laws
- responsible for derivations for any order reaction where A → products
- responsible for derivations for half-life formulas for any order where A → products
- Genchem problems where you solve for rate law, [A], $[A]_0$, t, and/or k
- Pchem problems where you determine the rate law, $[A]_0$, t, and/or k (yes, you would need to use the computer for this. You will have access to the Olin computer lab in case it is needed.)
  - Can use p, [A], g, or moles when graphing integrated rate laws.
  - Pay attention to units for k depending on which variable used for graphing.

22.4 Reactions approaching equilibrium (2009 NR this section)

22.5 The temperature dependence of reaction rates
- -two factors that are necessary for a collision to occur
- -be able to explain reaction order diagrams (The E vs. time diagrams that have reactants, TS, intermediates, products, activation energies)
- -Arrhenius equation (3 different forms)
- -Applications related to lab (What does T dependence mean, how does one find it, how does one report it, why is it important to scientists?)

22.6 Elementary reactions
- Mechanisms
  - definitions and questions in your class notes for the sections on mechanisms and catalysts
  - how to determine the slow or fast steps in a mechanism (usually given, but if not…slow step matches exp. rate law. Slow step is usually NOT an equilibrium step)
  - testing mechanisms to determine if they are theoretically correct

22.7 Consecutive elementary reactions (NR this section)
- Steady state approximation