

## Physical Chemistry: Thermodynamics and Kinetics - Chemistry 561 – Spring 2017

**Class: MWF 9:55 – 10:45 AM, Chemistry 1315**

**Discussion Section:** Chem B379 (301) or Chem B357 (302).

Instructor: J.R. Schmidt

Room 8305d, email: [schmidt@chem.wisc.edu](mailto:schmidt@chem.wisc.edu)

J.R.S. Office Hours: immediately after every class and one hour to be determined

Teaching Assistant: Kyeong-Jun Jeong

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Office hours and location to be determined

Section 301 (12:05 PM), section 302 (2:25 PM)

Text: Atkins and de Paula, *Physical Chemistry* 9<sup>th</sup> edition (used copy/online bookseller)

Website: [learn@UW](mailto:learn@UW) for notices, problem sets, exams, handouts, power points, answer keys

### Tentative Course Outline

Thermodynamics is a “theory of everything”, and is one of the most beautiful branches of science we know, touching every aspect of our lives. It’s also incredibly fun to learn (really). We will learn this subject by following the textbook in order:

Chapter 0 Fundamentals (on your own)

Chapter 1 Gases

Chapter 2 The First Law of Thermodynamics (Heat, Work, and Energy)

Chapter 3 The Second Law of Thermodynamics (Entropy and Irreversibility)

Chapter 4 The Phases of a Pure Substance

Chapter 5 Mixtures and Solutions

Chapter 6 Chemical Equilibrium

Thermodynamics tells us “what” we get when we get there, but the subject of kinetics describes “how” we get there as well as “how fast”. One goal of kinetics is to describe chemical reactions at the molecular level. We will cover selected portions of the following chapters:

Chapter 20 Molecules in Motion

Chapter 22 Molecular Reaction Dynamics

**Exams.** We will have two in-class exams, one two-hour final exam, and four in-class quizzes. The final exam will be comprehensive. See the attached calendar. **Note these dates! There are no makeup exams or quizzes.**

- |                                |                               |
|--------------------------------|-------------------------------|
| 1) Exam 1: Monday, February 27 | 20%                           |
| 2) Exam 2: Monday, April 3     | 20%                           |
| 3) Final Exam: Tuesday, May 9  | 30% 120 minutes, 5:05-7:05 PM |
| 4) Homework                    | 20% 11 problem sets           |
| 5) Four Quizzes                | 10% (2.5% each)               |

**Problem sets** will be assigned most weeks (see the calendar). **You may hand in three submissions late, by the start of the next class.** These three late submissions are intended to

cover all circumstances. A fourth late submission will not be accepted. Not all problems on the problem sets will be fully graded, but we will do our best.

Power-point presentations will be posted electronically on learn@UW, but lecture notes will not. *Please attend all classes!* Not all subjects presented in class will be from our textbook.

***Our discussion sections will focus on problem solving, including sample problems that will help you solve assigned problems. It is absolutely vital that you attend and participate in every discussion section. We cannot emphasize this strongly enough.***

Hints on Problem Sets: We encourage you to work with your fellow classmates after you first try solving the problems on your own. When you work together, you will solve problems in a way you had not thought of before, but you will also need to practice solving problems solo.

After you solve a problem, look over your answer to make sure that you understand the mathematical steps and physical picture. *Each equation tells a story – we will create these stories together. This story telling is what make thermodynamics and kinetics meaningful.*

If your problem set solutions are not neat and readable, please copy over your answers on a new sheet of paper. The grades on problem sets will reflect not only your final answer but also the clarity and neatness of your solution. Although I encourage you to work together in solving problems, the solutions you submit should be your own.

Please also fully utilize our office hours. I will linger after each class to answer any questions. And please, please ask questions during class, especially if you are confused.

### **Grading Scheme**

My goal is for everyone to learn thermodynamics and kinetics, to appreciate their importance, and to earn a good grade. Historically, the average GPA for chem 561 is about 2.85, with similar numbers of grades in the categories of (A + AB) and (B + BC).

**Electronic data websites:** <http://webbook.nist.gov/chemistry/> for molecular properties  
See also [www.library.edu/chemistry/](http://www.library.edu/chemistry/) for links to the CRC, Web of Science, and Scifinder Scholar. You can download the PHET demos at <https://phet.colorado.edu>.