

**Chemistry 331****Physical Chemistry I****Fall 2009**

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Lecture: MWF 10:30-11:30, Reichardt 203  
Laboratory: T 11:30-2:30, Reichardt 245  
Office Hours: MW 8:00-10:00, R 2:00-5:00, F 8:00-9:00, after class and by appointment  
Textbook: Physical Chemistry, Second Edition, by Thomas Engel and Philip Reid  
or Thermodynamics, Statistical Thermodynamics, & Kinetics, Second  
Edition, by Thomas Engel and Philip Reid  
TA: Jennifer Bell ([jschambers@alaska.edu](mailto:jschambers@alaska.edu))

**Course Description (from the UAF 2009-2010 catalog):** Principles of thermodynamics and kinetics with applications to phase equilibria, solutions, chemical equilibrium and electrochemistry. Course teaches these concepts using both lecture and laboratory instruction. Prerequisites: CHEM F106X; MATH F202X; PHYS F104X or PHYS F212X; or permission of instructor. (3+3)

**Course Goal:** Chemistry 331 is the first semester of a two-semester series in physical chemistry. The goal of the series is to provide you with a mathematical and physical understanding of why chemical and physical systems behave as they do. In 331, we will cover most of chapters 1-11 and 33-36 (1-11 and 16-19 if you bought the one-semester book).

**Learning Outcomes:** In Chemistry 331, you will study thermodynamics, statistical thermodynamics and kinetics. We will apply these concepts to practical applications including chemical equilibria, solutions, electrochemical cells and complex reaction mechanisms. You will practice using these concepts to explain behavior observed in your weekly laboratory experiments. By the end of the course, you will have gained a new, physical and mathematical, understanding of thermodynamics and kinetics and be able to apply this understanding to solving quantitative problems.

**Grading:** Your course grade will be determined by your combined scores on three one-hour exams, a final exam, laboratory reports and homework assignments. The point breakdown is given below:

3 hour-long exams (100 points each)	300 points
final exam (Dec. 18 <sup>th</sup> , 10:15 AM-12:15 PM)	100 points
laboratory	150 points
homework	100 points
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total	650 points

The tentative grade scale is as follows:

585-640 points	A
520-584.9 points	B
455-519.9 points	C
390-454.9 points	D
<389.9 points	F

I may curve the grades so that lower point totals than listed in each range above get a higher grade, but if you get the lowest number in the range listed above, you are guaranteed at least that grade. I will not use +/- grading.

**Exams:** Each exam is worth ~15% of your grade. The exams during the semester are an hour in length and are on the information presented during the weeks listed below:

Exam 1	Weeks 1-3
Exam 2	Weeks 4-7
Exam 3	Weeks 8-11

The final exam is on December 18, 2009, from 10:15 AM - 12:15 PM in NSF 203. It is two hours long and is cumulative, although it emphasizes the material covered during weeks 12-14. The time (Friday, December 18<sup>th</sup> from 10:15-12:15 PM) of the final exam has been set by the UAF Registrar. No early or late exams can be scheduled. If you miss the scheduled exam due to travel, then the University policy on Incomplete (I) grades will be invoked.

During the exams, you may use a non-programmable calculator and the front side of one half of an 8 ½" by 11" piece of paper with only formulas on it (no worked problems). It is my prerogative to check your formula sheet and make sure that there are only formulas on it. If your sheet contains other information on it, it will be considered cheating (see the Chemistry Department Policy on Cheating below). If you have any questions about what is acceptable to have on the sheet, check your sheet with me before the exam. Preparing your formula sheet will help you study for the exam, so it is in your best interest to make your own sheet and not copy someone else's sheet. In addition, I will include a sheet of important constants, equations and a periodic table at the end of each exam. However, your equation sheet should contain the equations you think you will need even though I give you an equation sheet, because the equations you need might be difficult to find in a timely manner on my sheet.

Make-up exams will be allowed, if you have a good reason. Good reasons include: participating in UAF sporting events, unavoidable work conflicts, illness, family or personal difficulties, etc. However, you must let me know as soon as you learn of the conflict (sports or work) or as soon as is possible (illness, family or personal difficulties) and we will make arrangements for you to take a make-up exam.

**Laboratory:** An important component of Chem 331 is the laboratory session. The purpose of the lab is to reinforce lecture concepts through hands-on investigation. You will also gain skills in scientific reasoning and use of chemicals and laboratory apparatus. Your final lab grade will be based on the scores of the best 10 (out of 12) lab reports. There will be no make-up labs.

There are significant hazards in any chemistry laboratory. If you suspect you are pregnant or have other health concerns, you should contact your doctor. For most individuals, the most significant concern is eye safety. You are required to continually wear approved eye protection while in the laboratory. Having safety glasses pushed onto your forehead is not acceptable.

It is also critical that you arrive to lab prepared and on time. Students who arrive unprepared or late may be refused admittance into the lab.

**Homework:** There will be approximately weekly homework assignments in Chem 331. The assignments will be posted on the Chem 331 Blackboard site and announced in class. Usually, the homework will be due at the beginning of class on Fridays. I do not accept late homework, so turn in whatever you have completed by the beginning of class. I recommend working with, not copying from, other students in the class. Working in a group facilitates learning and makes doing your P-chem homework a little less onerous.

**Blackboard:** CHEM 331 has a site on Blackboard (<http://classes.uaf.edu/>). On the site, you will find the syllabus, homework assignments, sample exams, exam and homework solutions, links to other sites, etc.

**Chemistry and Department Policy on Cheating:** Any student caught cheating will be assigned a course grade of “F”. The student’s academic advisor will be notified of this failing grade and the student will not be allowed to drop the course. Unauthorized “dry labs” and unauthorized collaborations during exams are *examples* of cheating.

**As a UAF student, you are subject to UAF’s Honor Code**

([http://www.uaf.edu/catalog/catalog\\_09-10/academics/regs3.html#Student\\_Conduct](http://www.uaf.edu/catalog/catalog_09-10/academics/regs3.html#Student_Conduct) or pp. 47-48 of the UAF 2009-2010 catalog):

*“Honesty is a primary responsibility of you and every other UAF student. The following are common guidelines regarding academic integrity:*

- 1. Students will not collaborate on any quizzes, in-class exams, or take-home exams that contribute to their grade in a course, unless the course instructor grants permission. Only those materials permitted by the instructor may be used to assist in quizzes and examinations.*
- 2. Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses, and other reports.*
- 3. No work submitted for one course may be submitted for credit in another course*

*without the explicit approval of both instructors.*

*Alleged violations of the Code of Conduct will be reviewed in accordance with procedures specified in regents' policy, university regulations and UAF rules and procedures."*

**Students with Documented Disabilities:** If you have a documented disability and need reasonable academic accommodations, you should discuss these with me during the first two weeks of class. You will need to provide documentation of your disability to the UAF Office of Disability Services at 612 N. Chandalar, [fydso@uaf.edu](mailto:fydso@uaf.edu), 474-5655, TTY 474-1827 or [www.uaf.edu/disability/](http://www.uaf.edu/disability/).

**Physical Chemistry Survival Guide:**

1. Go to class. – If you do not keep up with the class, you will have difficulty doing well on the exams and homework.
2. Read the lecture material before class. – You learn more when you see something for the second time. Also, you will be prepared to ask questions about topics that are confusing you.
3. Ask questions during lecture. – If you have a question, ask me. Someone else in the class probably has the same question.
4. Do your homework. – I cannot stress how important it is for you to do your homework! Exam questions will frequently be like homework questions. Also, the more you practice solving P-chem problems, the faster you will be at answering the questions on exams and the easier the exams will be.
5. Start your homework early. – The earlier you start, the more time you will have to ask me questions if you get stuck. I do not appreciate phone calls at midnight the night before the homework is due...
6. Ask for help! – If you have trouble with a problem, see me, your TA or one of your classmates as soon as you can. This gives you plenty of time to solve the problem before it is due.
7. Work other problems. – The more you practice, the easier it gets!
8. Expect to spend a lot of time on this class. – P-chem is a difficult class and it will take you a long time to understand the concepts and feel comfortable solving the problems presented in class or lab and on the homework. The more you study the material and practice solving problems, the easier the exams and homework will be.
9. Study the worked examples in the book. – The authors did not do these problems just for fun. These problems are designed to help you understand how to approach problems and will be very similar to the homework and exam questions.
10. Don't forget what we covered earlier in the semester. – Many of the same concepts will appear again and again throughout the class. Also, the final is cumulative, so you will want to keep the earlier material fresh in your mind.
11. Use dimensional analysis. – If your units did not work out, you have done something wrong.

Date	Ch.	Topics	Lab Experiments
Sept 4		Introduction	No Lab
Sept 7-11	1	Sept 7 - Holiday! Fundamentals Concepts of Thermodynamics	Lab Safety and Introduction to P-chem Lab
Sept 14 -18	2	Heat, Work, Internal Energy, Enthalpy, and the 1 <sup>st</sup> Law of Thermodynamics	Adiabatic Expansion: Cooling of Gases
Sept 21-25	2,3	1 <sup>st</sup> Law and State Functions	Thermochemistry: Chemical Hot/Cold Packs
Sept 28-Oct 2	3,4	State Functions and Thermochemistry	Thermochemistry: Heat Capacities
Oct 5-9	4,5	Thermochemistry and Entropy	Thermochemistry: Enthalpy/Entropy of Mixing
Oct 12-16	5	2 <sup>nd</sup> and 3 <sup>rd</sup> Laws of Thermodynamics	Gas-Phase Equilibria: NO <sub>2</sub> Dimers
Oct 19-23	6	Chemical Equilibrium	pKa of an Indicator
Oct 26-30	6,7	Equilibrium and Real Gases	Ionic Strength Effect on Equilibria
Nov 2-6	8,9	Phase Diagrams and Ideal and Real Solutions	pH Measurements via Electrochemistry
Nov 9-13	10,11	Electrolyte Solutions and Electrochemical Cells	Electrochemistry: Battery Discharge Chemistry
Nov 16-20	33(16)	Kinetic Theory of Gases	Kinetics of Hydrolysis
Nov 23-27	34(17)	Nov 27 - Holiday! Transport Phenomena	Keto/Enol Tautomerization as Probed by NMR
Nov 30-Dec 4	34-35 (17-18)	Transport Phenomena and Chemical Kinetics	Enzyme Kinetics: Inversion of Sucrose
Dec 7-11	36(19)	Complex Reaction Mechanisms	Review
Dec 14-18		Dec 14 – Review <b>Dec 18 – Final Exam</b> <b>(10:15 A.M. – 12:15 P.M.)</b>	No Lab

**Important Dates:**

Last day to drop class and get 100% refund..... Friday, Sept. 11

Last day to drop class w 50% refund (course not on academic record) ... Friday, Sept. 18

Last day for student- or instructor- withdrawal ("W" on academic record)Friday, Oct. 30

Last day of instruction: ..... Monday, Dec. 14

Final exam: ..... 10:15 A.M.-12:15 P.M., Friday, Dec. 18