

Course: Physical Chemistry, 3610 Lecture**Fall 2007**

Chem 3610-07

Credit: 3 hours**Location:** Sundquist E303**Times:** 11:15 – 12:10 MWF**Prerequisite:** Chem 1120 or (1020 and 1840) and Math 1810 or 1910 (1910 much preferred)**Instructor:**

Dr. Ron Robertson

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Physical Chemistry, 8th edition, P.W. Atkins and Julio de Paula, W. H. Freeman Publishing, 2006 (available in APSU bookstore)

Supplementary materials

This text has a good bit of multi-media support online. The student solutions manual is not available in the bookstore but you should be able to purchase it online. Use it very carefully – the solutions often do not follow from our treatment of the material. I grade homework on a logical development of a solution – you can lose points by blindly copying a solution!

A scientific calculator is essential. Special function keys should include scientific notation, fractional roots, natural and common logarithms, and exponential functions (e^x and 10^x). The use of programmable calculators (like the TI-80 series) is prohibited on Exams and Quizes.

Course Description, Content, and Objectives

This course emphasizes and develops the general core areas of reasoning, scientific knowledge and numerical understanding. These areas involve the university's mission to develop skills of inquiry, abstract and logical thinking, and critical analysis; the ability to understand and use numbers and statistics; and an understanding of the scientific method.

Physical chemistry studies the underlying physical principles that govern the properties and behavior of chemical systems. In a sense all other chemists come back to physical chemistry to truly understand what is happening. Chemical systems can be studied from a microscopic or macroscopic viewpoint. The microscopic viewpoint makes explicit use of the concept of molecules. The macroscopic viewpoint studies large-scale properties of matter without the explicit use of the molecule concept.

There are many ways to organize the study of physical chemistry. One way outlined in your text is between the areas of "Equilibrium", "Structure", and "Change". Another way

is to break p chem into five area disciplines: thermodynamics, transport, quantum chemistry (including spectroscopy), statistical mechanics, and kinetics. In this 2 course sequence we will use the macro view to explore heat and energy (thermodynamics) and the related areas of equilibrium and electrochemistry. We will use a micro viewpoint to explore kinetics, spectroscopy and transport properties. Statistical mechanics is the link between the micro and macro world; it is where we scale up the micro world to arrive at macro parameters. It is chemistry in the finest sense, but unfortunately is beyond the scope of this course.

Introductory calculus is required for this course - you must know how to differentiate (including partial differentiation) and integrate!

This differentiation and integration will include exponential/logarithmic functions. In 3610 we will cover some of the material in chapters 1-7 and 21-22: gases, 1st and 2nd laws of thermodynamics, phase equilibria, chemical equilibria, and kinetics. In 3620 we focus on the kinetics of the atmosphere, polymer kinetics, electrochemistry, transport properties, and quantum mechanics and spectroscopy.

Your physical chemistry text shows you many equation derivations as well as “number” problems; remember I said that other chemists come to physical chemistry for their theory. You will be held accountable for the derivation of some of these equations; for others we will merely use them to solve problems. Equations summarize concepts and ideas; they are in one sense a shorthand way of explaining the operation of the world. Equations do even more, however; they allow us to be **predictive**. The main reason for understanding the operation the physical world is to be able to predict what will happen in another situation. For this reason physical chemistry looks very mathematical, but try to think of our problems as a means of predicting the future or understanding the past.

I encourage your active participation in class. We are a select group. Feel free to ask questions before, during and after class. I would hope to pull you "kicking and screaming" through this course. My definition of science is "organized curiosity" and I don't want you to lose your sense of wonder as we explore together the complexities of Mother Nature. If you find yourself having difficulty, please come and see me before you get too far behind.

Since our time together in class is short, I will focus first on the presentation of ideas and concepts. Our text is long and difficult, and I will be condensing much of the material. It is vital that you read the text and study the class notes to get the best understanding of the material. After you think that you have an understanding of the ideas and concepts presented (after you have the mental model) you should attempt the homework problems. Some problems will merely be review type questions, but others will allow you to "flex" your intellectual muscles and see how the concepts presented can be used to answer questions that a scientist would be asked.

Attendance and Conduct

You must be present to win. I consider this class to be "you and me" against the physical chemistry book. Take advantage of class time. I do reserve the right to reduce your final grade for excessive absences (more than 4). Each absence after 4 may reduce your final percentage grade by 3 percentage points. Also as explained below I do give pop quizzes and your grade may be affected by your absence (see evaluation below). Be there! Nuff said.

Students are expected to conduct themselves appropriately at all times. Academic and classroom misconduct will not be tolerated. Students must read the “Code of Student

Conduct" in the new Student Handbook for an understanding of what will be expected of them within the academic setting.

Evaluation Philosophy

My general philosophy is "A grade is an inadequate report of an inaccurate judgment by a biased and variable judge of the extent to which a student has attained an undefined level of mastery of an unknown proportion of an indefinite material" (Paul Dressel) Grades are not perfect or always fair, but I will pledge to be consistent. All of you will probably not be able to make A's but all of you can be successful in this course. I like the definition of success by John Wooden (former coach of UCLA's great basketball teams): "Success is peace of mind that is the direct result of self-satisfaction in knowing you did your best to become the best that you are capable of becoming". My pledge is to help you become the best you can be within your situation and opportunities. I urge you to do all you can in the time you have with what you have in the place you are.

I will test for true understanding of ideas as well as recognition of facts. I will guarantee you the following cutoffs: **A 84.5%, B 71.5%, C 59.5%, D 49.5%.**

My tests are layered in complexity. I evaluate in several areas: (1) a straightforward memorization of facts, (2) an understanding of ideas and concepts, and (3) an application of ideas to problem solving situations. Many types of questions are asked: short answer, multiple choice, mathematical problems, equation derivation, essay and discussion. There are many equations in p chem, and I will supply a few basic ones at the end of each exam. My goal in evaluation is to obtain the most information possible about your progress in the course.

Nuts and bolts of Evaluation

- a) Unless repeating either lecture or lab **you must be concurrently enrolled in both lecture and lab.** Lab is a very important part of this course and is certainly worth more than the official 1 credit hour. Students often complain about the amount of time spent on lab reports. As a result we will combine your lecture and lab grades so that you will receive the same semester grade for this course (lecture) as for lab. The grade will be 70% from lecture and 30% from lab.
- b) There will be five major exams during the term: four hour exams and a comprehensive final. I will announce in class at least a week in advance our hour exam test dates. The final will be:
Friday, December 7 (Final Exam over all material) 8:00 – 10:00.
- c) Your grade will be based on your performance on about 550 possible points. Each exam will count 100 points and the Final will count 150 points. Your lowest exam grade (excluding the Final) will be dropped. The Final Exam must be taken. **If you miss an exam for any reason other than representation of the university in an official capacity, that exam will qualify as the exam to be dropped.** If you miss a 2nd exam, a doctor's note or other approved documentation for special circumstances (approved by the instructor on a case by case basis) is necessary for exam makeup. It is best to take every exam possible in order to allow for unforeseen circumstances. It is my usual practice to go over your marked exams in class and to collect and keep all exams after we review them in class. You are welcome to come and study your old exams during times

mutually convenient to you and me. The thorough review of class notes and assigned problems is your best way to study for our exams.

Another roughly 100 points will come from problem sets and pop quizzes. I will occasionally give unannounced and announced quizzes. These evaluations will be about 10-20 pts each. If you miss class and have a written doctor's note, or if you have other special circumstances which have been approved by the instructor, you will receive your average percentage exam grade for the semester for that quiz or homework. If you do not fulfill the above requirements and are absent, you will receive a zero for that quiz or homework.

- d) You can work with others on all out of class assignments (homework) unless specifically indicated (for example a problem set). Cheating on exams and quizzes will not be tolerated. A grade of zero will be assigned for that exam or quiz as a first step, and the matter will be referred to student affairs for further action.
- e) Extra credit may be given for on campus participation in our chemistry outreach programs and for attendance at departmental seminars and other special departmental functions. There will be a limit of 5% total extra credit per semester. Details will be given for each event.
- f) I do **love** to see your worked out solutions to the problems as well as supporting background information on essay questions. An answer alone to a mathematical problem will receive little credit. I want to see how the wheels are turning!
- g) Any student who has a disability that may affect his/her academic performance is encouraged to make an appointment with me to discuss this matter, or you may contact Disability Services; telephone 221-6230; tty 221-6278; fax 221-7102.

Drop/Add Dates

I truly hope that you will not want to or feel the need to drop this course, but if you do . . . the following dates are important.

Last day to drop without a record	September 9
Last day to drop with an automatic "W"	October 8
Last day to drop with a "W,F, or FA"	November 8

Other comments

Minors (any non-student under the age of 18) accompanying staff, faculty, students, or visitors on campus are not permitted in the classroom. This is university policy.

I truly enjoy teaching chemistry and hope that we will have a profitable term. Please feel free to come by or call my office or to call me at home. Help with course material, discussion of career opportunities in chemistry, exploration of possible student research projects with me, or "shooting the breeze" are all possible topics for discussion. Good luck!

Chem 3610
Fall 2007

		Material covered	Reading	Questions and problems
M	Aug. 27		pp. 1-13	
W	29			
F	31			
M	Sept. 3	<i>Labor Day holiday</i>		
W	5			
F	7			
M	10			
W	12			
F	14			
M	17			
W	19			
F	21			
M	24			
W	26			
F	28			
M	Oct. 1			
W	3			
F	5			
M	8			
W	10			
F	12			
M	15	<i>Fall Break</i>		
W	17			
F	19			
M	22			
W	24			
F	26			
M	29			
W	31			
F	Nov. 2			
M	4			
W	7			

F	9			
M	12	<i>Veterans Day Holiday</i>		
W	14			
F	16			
M	19			
W	21			
F	23	<i>Thanksgiving Holiday</i>		
M	26			
W	28			
F	30			
M	Dec. 3			
W	5			
F	7	Final Exam 8:00 – 10:00		Final

The above schedule and procedures are subject to change in the event of extenuating circumstances.