

## CHEMISTRY 236, FALL 2002

**Instructor:** Joel Tellinghuisen [SC5521; Office Hours 12-1 MTR, 5-6 W]  
**Assistants:** Michael Bowers [SC7810, Ph 4-0844]  
Kyle Brown [SC7970, Ph 2-8265]  
Morgan Krim [SC7910, Ph 2-1876]  
**Lab Hours:** 1:10-4:00 p.m. MTR [SC7510]  
**Lectures:** 4:10-5:00 p.m. Wednesdays [SC5212H]  
**Lab Text:** *Experiments in Physical Chemistry* (6th edit.) by Shoemaker, Garland, and Nibler.  
*Physical Chemistry Laboratory* Campus Class Pak (available at Campus Copy, Rand).  
**Web Site:** <http://www.vanderbilt.edu/AnS/Chemistry/Tellinghuisen/>

Week of	Schedule	Activity	Experiments (# in lab text)
August 26		lecture	1. Temperature and Pressure Calibration
September 2		lecture	2. Thermal Expansivity of a Liquid
September 9		lecture	3. Bomb Calorimetry (6)
September 16		laboratory	4. Inversion of Sucrose (22, modifications)
September 23		laboratory	5. The Triple Point of a Substance
September 30		lecture	6. Freezing Point Depression (11, mods.)
October 7		lecture	7. A Spectrophotometric Study of Equilibrium
October 14		laboratory	8. Physical Adsorption of Gases (26)
October 21		lecture	9. Gas Kinetics (24)
October 28		laboratory	10. Binary Liquid-Vapor Equilibrium (14, mods.)
November 4		laboratory	<u>Note:</u> Experiments 1-5 constitute a core of required experiments, and 6-10 are elective experiments (see below). The theoretical background needed to understand these experiments is modest — within the scope of general chemistry in many cases. In any event, all the experiments are provided with adequate support material to make them self-contained. And all will be treated in the lecture portion of the course.
November 11		laboratory	
November 18		laboratory	
December 2		makeup & evaluations	
<u>Note:</u> On laboratory weeks, students should go directly to the laboratory.			

**Grade Computation:** Based entirely on laboratory work, including prelab quizzes, results, analysis, and reports. Final grades will be assigned on the basis of absolute point scores, with a total of 400 [50 for each of 7 labs, 50 peer evaluation points]:

A	345	A-	330	B+	315	B	300	B-	280
C+	270	C	250	C-	230	D+	220	D	210
D-	200								

The total of 50 points for each lab includes 10 for a prelab quiz, to be taken at the start of the lab period. The 50 "peer points" are to be allocated by each student to his/her lab partners (see below).

**Vanderbilt Honor Code:** In effect for all work. Lab teams are expected to collaborate on lab work, as discussed more fully below. Students should write and sign the following on each graded assignment: "I pledge my honor that I have neither given nor received unauthorized aid on this assignment." For the purposes of this course, "unauthorized aid" includes (but is not limited to) the use of manufactured data ("dry-labbing") and the use of data and reports obtained by other students in this or in previous years of this course.

Students will need goggles and bound notebooks (available in the bookstore); and a lab coat is recommended (purchasable from the Chemistry Storeroom). Students must wear safety goggles, full-length pants or lab coats, and shoes at all times while working in the lab. Sandals are not allowed, nor are foods and beverages. Shorts are permitted only under lab coats.

The course will meet six times for lectures and exam and seven weeks for laboratory experiments, plus one week for makeup work. Students will work in teams of three in the lab. These teams will be constituted by the course instructor, using a random number generator. Each team will submit a single report for each experiment, with all partners sharing credit. Seven experiments should be completed, including the five core experiments. Lab teams will of course collaborate on all lab work (except pre-lab quizzes, *vida infra*). Collaboration with other teams is not allowed, unless otherwise specified in special cases.

Laboratory reports need not be elaborate. The key here is clarity. Each report should be complete and sufficiently well organized that the TA reading and grading the report can follow it easily. A stapled collection of graphs and tables will NOT get the job done!

Writeups for all of the 10 experiments are included in the Class Pak. About half of these follow the descriptions in the lab text fairly closely. In addition some supplementary material will be made available in the laboratory, the library, and on the course Web page.

The laboratory is operated on the "station" principle: All required setups are in place throughout the semester, and students work at the different experiments in accord with a sign-up schedule. All students will do Experiment 1 in either the first or the second scheduled lab week. (Their second experiment in this two-week period should be 2, 4, or 7.) There are two stations for each of Experiments 2–5, but only one for each of the elective experiments (6–10). Thus, teams should plan ahead to ensure that they get their preferences for the two elective experiments. The only provision for repeating botched work is the inclusion of the makeup week in the schedule; *i.e.*, students will be allowed to work only on their scheduled lab days.

Students should come to lab on experiment days prepared to work efficiently and should record all "manual" data directly in their bound notebooks in ink. These notebooks should be submitted along with the reports, so each team will need three notebooks, one for each team member. In addition, students should utilize wise "backup" procedures to ensure against loss of data. The notebook should be initialized by the TA or instructor at the end of each lab day. This constitutes a key part of the "check-out" procedure, and students without such clearance will be liable for any damage or breakage subsequently found at their stations. For some experiments a copy of key data may also be required at the end of the day; check with the TA in charge of the experiment.

To encourage advance preparation for the experiments, we will hold pre-lab orientation sessions in the scheduled lecture time slot (W 4:10) each week that lab is in session. Also, each student will take a written quiz to be given at 1:10 p.m. on the day of the scheduled lab work. Quizzes will be administered by the TA in charge of the experiment and will count for 10 of the 50 points for the experiment. The quizzes will be based on the "Study Problems" included at the end of each writeup in the Class Pak. Answers to these problems are available on the course web page.

Reports are due at 4:00 p.m. on the regular lab day, one week after the completion of the experimental work. Late lab work will result in the loss of 10% (absolute) per late day. Teams that encounter unanticipated problems or serious delays may elect to "punt" on the delayed work and do the same or a different experiment in the makeup week. [Exceptions to late policy: Delays occasioned by equipment problems beyond the control of the students will be accommodated through special arrangements.]

The experiment stations must be left in a condition that will permit the next team using the setup to proceed immediately with their work. Follow the outdoorsman's rule: Leave the site better than you found it. Any carelessness that causes a subsequent team to lose time will result in the loss of as much as 10 of the 50 points for the experiment. This includes unreported breakage of equipment and spillage of chemicals or water away from the setup, *e.g.* on or by the balances.

The lecture part of the course will be devoted to the theory and practice of the experiments. An attempt will be made to cover experiments in advance of the time students do these in the lab. Thus, Experiments 1, 2, 4, and 7 will be covered in the first three lecture periods, along with one or two others. However, it is not necessary for students to wait for such lecture coverage to schedule experiments after the first two lab weeks.

Students will have 50 peer points (total) to allocate to their lab partners (maximum split, 40/10). This distribution will be submitted in writing in the final scheduled lecture period, on Dec. 4, the same day evaluations are done. Students who do not submit these peer point allocations will have their points distributed 25:25.