

CHEMISTRY 236, FALL 2001

Instructor: Joel Tellinghuisen [SC5521; Office Hours 12-1 MWF, 4-5 T, 5-6 W]
Assistants: Lisa Baker [SC7850, Ph 3-9411]
Laura Swafford [SC7910, Ph 2-1876]
Rachel Ward [SC7810, Ph 4-0844]
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 27		lecture	1. Thermal Expansivity of a Liquid
September 3		lecture	2. Bomb Calorimetry (6)
September 10		lecture	3. Inversion of Sucrose (22, modifications)
September 17		lecture	4. The Triple Point of a Substance
September 24		laboratory	5. Freezing Point Depression (11, mods.)
October 1		laboratory	6. A Spectrophotometric Study of Equilibrium
October 8		laboratory	7. Physical Adsorption of Gases (26)
October 15		laboratory	8. Gas Kinetics (24)
October 22		lecture	9. Binary Liquid-Vapor Equilibrium (14, mods.)
October 29		laboratory	<u>Note:</u> Experiments 1-4 constitute a core of required experiments, and 5-9 are optional experiments (see below). The theoretical background needed to understand these experiments is modest — within the scope of general chemistry in most cases. However, Experiments 5-9 do contain components that may not have been encountered previously, and in some cases may not be treated at all in Chemistry 236. Still, all are provided with adequate support material to make them self-contained.
November 5		laboratory	
November 12		review & makeup	
November 26		Exam (Nov. 28)	
December 3		Evaluations	
<u>Note:</u> On laboratory weeks, students should go directly to the laboratory.			

Grade Computation: 25% for problem sets, 30% exam, 45% for laboratory work, including results, analysis (with error analysis), and reports. Final grades will be assigned on the basis of absolute point scores, assuming a nominal total of 400 [25 for each of 4 problem sets, 30 each for lab results and analyses (6), and 120 for the exam]:

A	360	A-	350	B+	340	B	320	B-	310
C+	300	C	280	C-	270	D+	260	D	240
D-	230								

There will be some bonus points in addition to these 400. Included among these are 25 "peer points," to be allocated by each student to his lab partners (see below). Problem Set 5 will also count as bonus points.

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 problem solutions, 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 seven times for lectures and exam and six weeks for laboratory experiments (plus one week for makeup work). Students will work in teams of three in the lab. Each team will submit a single report for each experiment, with all partners sharing credit. Each team should complete six experiments, including the four 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. Work on problem sets and the exam will be done independently, under the honor code.

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 9 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. There are two stations for each of Experiments 1–3, but only one for each of the other six. 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 5 of the 30 points for the experiment. The quizzes will be based on a number of "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 5 of the 30 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 heavily emphasize the processing, analysis, and display of data. The main tool for this instruction is a program called KaleidaGraph, which is available in the Stevenson Computer Classroom (now equipped with PCs), in Branscomb (Mac and PC), in Wilson (Macs) and on some PCs in Garland. The vehicle for this instruction is the five problem sets included in the Class Pak. Problem Sets 1–4 are due at 4:10 p.m. on the specified due dates. The 5th is optional, may be done for bonus points (max 25), and is due December 12. Late homework will not be graded.

A single exam is scheduled for the next-to-last regular lecture period in the course (November 28). This exam will be comprehensive, with roughly 40% on data analysis and the rest on the experiments. Since not everyone will be doing the same experiments, there will be options on the test. Students may work for as long as two hours on this exam. The exams will be returned to students the last week (December 5) along with their provisional grades in the course. Students may then elect to submit the bonus problem set to improve their grades.