

CHEMISTRY 236, FALL 2006

Instructor: Joel Tellinghuisen [SC5521; Office Hours 12-1 MTR, 5-6 W]
Assistants: Stephen Chmely
Amanda Landis
Ralf Mueller
Michael Schreuder
Lab Hours: 1:10-4:00 p.m. M–R [SC7510]
Lectures: 4:10-5:00 p.m. Wednesdays [SC5211]
Lab Text: *Experiments in Physical Chemistry* (7th edit.) by Garland, Nibler, and Shoemaker.
Physical Chemistry Laboratory Class Pak (available at Campus Copy, Rand).
Web Site: <http://www.vanderbilt.edu/AnS/Chemistry/Tellinghuisen/>

Week of	Schedule Activity
August 21	Lec (Intro, Stats)
August 28	Lec (1,2); Comp
September 4	Lec (3,4); PS1; Comp
September 11	Lec (Stats,5); PS2
September 18	LAB ; Lec (6,7); PS3
September 25	LAB ; help
October 2	Lec (8,9); PS4
October 9	LAB ; Quiz 1
October 16	Help
October 23	LAB ; help
October 30	LAB ; Quiz 2
November 6	LAB
November 13	makeup LAB ; help
November 27	Quiz 3 (Nov. 29)

Note: On **LAB** weeks, students go to SC7510 on their lab day; for **Comp**, Garland 119.

Experiments (# in lab text)

1. Temperature and Pressure Calibration
2. Inversion of Sucrose (22, modifications)
3. Bomb Calorimetry (6)
4. The Triple Point of a Substance
5. Spectrophotometric Study of Equilibrium
6. Freezing Point Depression (11, mods.)
7. Thermal Expansivity of a Liquid
8. Physical Adsorption of Gases (26)
9. Binary Liquid-Vapor Equilibrium (14, mods.)

Note: Experiments 1-4 constitute a core of required experiments, and 5-9 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.

Grade Computation: Based on laboratory work (quizzes, results, analysis, and reports — 6×35), 3 quizzes (101), problem sets (4×10 + 5×5), and peer points (24). Final grades will be assigned on the basis of absolute scores, out of a total of 400:

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

Each team submits a single report for each lab; the 35 points include 5 for a prelab quiz taken (individually) at the start of the lab period. The peer points are to be allocated by each student to his/her lab partners (see below). The lecture quizzes and problem sets will be explained.

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.

Laboratory work is scheduled for seven weeks, including the last week for makeup work only. Students will work in teams of three, to be constituted by random number generation. Each team will submit a single report for each experiment, with all partners sharing credit. Six experiments should be completed, including the four core experiments. Collaboration with other teams is not allowed, unless otherwise specified in special cases.

Laboratory reports should not be elaborate. The key is clarity. Each report should be complete and sufficiently well organized that the instructor reading and grading the report can follow it easily. Attention will be devoted to the preparation of good tables and figures, properly labeled, with self-sufficient captions.

Writeups for all of the nine 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 and on the course Web page.

The laboratory is operated on the "station" principle: Most 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 must be 2, 5, or 7.) There are two stations for each of Experiments 2–4, but only one for each of the elective experiments (5-9). 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. All notes on experimental procedures will need to be entered in the notebook in ink before the start of the period, as will all "manual" data recorded in the experiment. (*i.e.*, students will not be permitted to work from Class Paks.) The notebooks must 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 main notebook for the experiment must be initialized by the 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 all experiments, preliminary results and analysis must be submitted at the end of the period, as specified in the "Tips" section of the Class Pak.

To promote advance preparation for the experiments, PowerPoint (PP) presentations are available on the course web site. Each student will take a short, 5-point written quiz at 1:10 p.m. on the day of the scheduled lab work. These quizzes will be based on the experimental procedures, as covered in the Class Pak, the PP document, and the PreLab Preparation questions in the Class Pak.

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% (3 points) 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 many as 10 of the 30 team 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. Mastery of the Study Problems included at the end of each writeup in the Class Pak is essential for understanding the experiment. Accordingly, at the beginning of the lab period, students must submit their solutions to these problems for the experiment they are doing that day. Answers (often very terse!) are provided on the course web site. In addition, on this part of the course and this part only, you may collaborate with other students as you like. However, we insist that you prepare your own handwritten solutions. The instructor will assign up to 5 points for your efforts, and we will take the best 5 of 6 for the semester. The three scheduled lectures quizzes will be based largely on the same Study Problems.

The primary tool for data analysis and presentation in the course is the KaleidaGraph (KG) program. The Class Pak includes 4 assignments worth 10 points each and based on KG, statistics, and data analysis.

Students will have 24 peer points (total) to allocate to their lab partners (maximum to one partner = 18). This distribution will be submitted in writing with the last quiz, on Nov. 29. It is not necessary to allocate all 24 points; students who do not submit these allocations will have their points distributed 12:12.