

CHEMISTRY 236, FALL 2004

Instructor: Joel Tellinghuisen [SC5521; Office Hours 12-1 MTR, 5-6 W]
Assistants: Chris Blanton []
Danielle Garrett [SC7810, Ph 4-0844]
Morgan Krim [SC5512, Ph 2-5013]
Ana Petrovic [SC5522, Ph 2-2643]
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	Experiments (# in lab text)
August 23	Lecture (1)	1. Temperature and Pressure Calibration
August 30	Lecture (2 & 5)	2. Inversion of Sucrose (22, modifications)
September 6	Lecture (7)	3. Bomb Calorimetry (6)
September 13	LAB	4. The Triple Point of a Substance
September 20	LAB	5. Spectrophotometric Study of Equilibrium
September 27	Lecture (3 & 4)	6. Freezing Point Depression (11, mods.)
October 4	Lecture (6 & 9)	7. Thermal Expansivity of a Liquid
October 11	LAB	8. Physical Adsorption of Gases (26)
October 18	Lecture (8)	9. Binary Liquid-Vapor Equilibrium (14, mods.)
October 25	LAB	<u>Note:</u> 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.
November 1	LAB	
November 8	LAB	
November 15	makeup & evaluations	
November 29	Exam	
<u>Note:</u> On laboratory weeks, students should go directly to the laboratory on their lab day.		

Grade Computation: Based on laboratory work (prelab quizzes, results, analysis, and reports) and exam. Final grades will be assigned on the basis of absolute scores, with a total of 400 [45 for each of 6 labs, 30 peer evaluation points; 100 exam]:

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

The 45 points for each lab includes 5 for a prelab quiz, to be taken at the start of the lab period. The 30 "peer points" are to be allocated by each student to his/her lab partners (see below). The exam will include some choices, to cover the ranges of optional experiments done by different teams.

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 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. Six experiments should be completed, including the four core experiments. Lab teams will of course collaborate on all lab work (except pre-lab quizzes, *vide 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 instructor 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 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: 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, 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 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 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 instructor in charge of the experiment.

To promote advance preparation for the experiments, PowerPoint presentations for each experiment will be made available on the course web site. 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 instructor in charge of the experiment and will count for 5 of the 45 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 45 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. Most of the experiments will be covered in advance of the time students do these in the lab. However, one (possibly two) of the experiments will not be discussed prior to the third scheduled lab period. Nonetheless, students may perform Experiments 8 and 9 in that period (week of October 11) if they want to. Since this course is now a "stand-alone," independent from Chemistry 230 in content, the material in these lectures is important for your full comprehension of the experiments. It will be covered in the end-of-term exam.

Students will have 30 peer points (total) to allocate to their lab partners (maximum to one partner = 25). This distribution will be submitted in writing with the exam, on Dec. 1. It is not necessary to allocate all 30 points; students who do not submit these allocations will have their points distributed 15:15.