

If there is any student in this class who has special needs because of learning or physical disabilities, please contact the Office of Academic Support (OAS) at 895-2490.

Course Prerequisite

The prerequisite for this course is CHM 116 or a full year of General Chemistry. An understanding of basic equilibrium concepts, stoichiometry, and naming topics from general chemistry is expected.

Course Objectives

The lecture and laboratory portions of this course will allow students to:

1. Become familiar with common analytical laboratory techniques and procedures.
2. Further develop an understanding of equilibrium through their mathematical relationships and through their chemical relationships in the laboratory.
3. Enhance understanding of statistical terminology and applications in the laboratory environment.
4. Learn about current analytical instrumentation and its uses.
5. Obtain laboratory samples, analyze them, and report upon them in a professional manner.

Course Materials

1. Harris, D. C., *Exploring Chemical Analysis, 2nd Ed.*, Freeman, 2001.
2. A laboratory notebook with **bound and numbered pages**, such as the Ampad 26-251, available in the Bookstore and many commercial outlets. Do not spend money on duplicate-page books.
3. A calculator capable of scientific notation, log/antilog, and \ln/e^x functions. Calculators equivalent to and including TI-92's (those that can easily store text) are **not allowed** on exams.

Lecture/Discussion Expectations

The goal of the lecture is to point out the most critical information in the text, explain some of the more complicated concepts, expand on the text, and provide you with a chance to work some problems and ask questions. Questions are welcome during lecture—please ask. You are responsible for reading the text BEFORE CLASS and for all of the material in the text, whether it is explicitly covered in lecture or not.

Exams

There will be four exams given during class. **No late make-up exams will be given and no exams will be dropped.** If you miss an exam and can document the absence for **valid reasons (documented by letters from physicians, lawyers, or members of the clergy)** the final will be worth proportionally more. Unexcused or unconfirmed absence from an exam will result in a grade of zero. Books, papers, and/or notes are prohibited during any exam UNLESS SPECIFIED BY THE INSTRUCTOR. Some portions of some exams may have open book/open note sections to the exam. Violations of this rule will be reported to the Dean of Student Affairs and will result in a failing grade for the exam, if not for the course.

Problem Assignments

To succeed in the lecture and laboratory portions of this exam, it is critical that you enhance and improve problem-solving skills. Such skills are improved through actually working problems. Merely looking at worked examples is insufficient. A series of practice homework problems will be assigned

each week. You are expected to work on these problems throughout the week, and discuss questions as they arise.

Graded assignments will consist of the following:

1. Homework sets specifically assigned to be done outside of class and due when announced.
2. Unannounced collection of the practice homework problems assigned in class.
3. In-class problems to be worked individually or in groups.

Please note that you will not receive credit for homework collected unannounced or done in class if you were absent from class. Eleven homework assignments will be made, the lowest one will be dropped.

Laboratory

To successfully complete the laboratory, you **MUST** read each experiment before coming to lab, estimate the amount of time it will take you to complete the experiment and get materials ready for the next experiment, and clean up. **HAVE A PLAN!** Many labs include several drying steps, which may require several hours of waiting...unless you have prepared other lab work to do.

One important goal of the laboratory is to teach proper care and laboratory technique. There are only one or two correct ways to perform most laboratory procedures and manipulate equipment. Focus on learning how to do things correctly instead of doing things again. Poor laboratory technique will result in poor laboratory grades and time wasted repeating experiments. If a method or technique is unclear, **ASK!**

It is essential to be present at the start of lab. Prelaboratory discussions for experiments that you may begin that day will be presented. Attendance is mandatory, even if you are not ready to begin that particular lab. If you are more than 15 minutes late for lab, you will automatically lose 10% of the points on the lab corresponding to the prelab missed. You will more or less work at your own pace in the laboratory, though report due dates are given.

Laboratory Notebooks

A bound, quad-ruled notebook is required for the laboratory. A set of rules and format information will be handed out in the laboratory. Your notebook must be brought to **all** scheduled labs. **ALL WORK** must be written in the notebook. **ALL DATA** must be written directly into the notebook—not scribbled on scraps of paper and recorded later. In the “real world”, that often gets you fired. Here, it will cost you 10% of that lab grade. Notebooks will be collected twice this semester for comments and grading.

Unknowns and Reports

Many of the laboratory experiments performed involve unknowns. **UNKNOWNNS** will be dispensed in stoppered test tubes. Results will be graded for precision and accuracy, with accuracy being the most critical. Results of the analyses will either be reported on a 3 x 5 index card or through a written report. Written reports will be discussed. Late reports of any sort will lose 10% of their value. Additional sample requests will also result in a 10% deduction, since adequate sample will be provided at the beginning of the laboratory. Incorrect calculations requiring recalculation before a lab can be graded will also result in a point deduction.

Goggles and Breakage

You are required to wear splash-proof goggles at all times when **ANY** chemical manipulations are being performed—even if you are “just weighing” a sample. Goggles are provided, though you may purchase your own. If you do purchase your own, they must be acceptable to the standards the

chemistry department is responsible for enforcing. Safety glasses are not acceptable. Please be aware that you will be billed for excessive breakage. Each item broken must be reported to the stockroom and replaced. The more precise the glassware, the more expensive the glassware—burets, for example, cost about \$60.

Special Topics

Occasionally, you may have the opportunity to do some small, extra investigations to shed more light on chemistry from the analytical chemistry point of view. These explorations may involve laboratory, library, or web work.

Attendance

You are expected to attend every class—lecture and laboratory. No make-up laboratories will be scheduled, nor will notes be provided by the instructor for missed classes. Please see the note under “Laboratories” for information about missed prelabs.

Grades

Your course grade will be determined by the following:

<u>Lecture</u>	<u>Points</u>	<u>Laboratory</u>	<u>Points</u>
Exam 1	100	Aspirin statistics	10
Exam 2	100	Gravimetric % Cl	50
Exam 3	100	[NaOH] and [HCl]	10
Exam 4	100	Vinegar (written report)	40
Final Exam	170	pKa (written report)	50
Problem sets, 10 pts each (14 total, 13 count)	130	EDTA-Ca titration	50
		ISE of F ⁻ (written report)	50
<u>Special Topics</u>	<u>30</u>	Fe in Foods/Vitamins (poster)	50
Lecture Points:	730	AAS of Copper	20
		HPLC experiment	20
		<u>Notebook Checks</u>	<u>50</u>
		Laboratory Points:	400

Total Points: 1100

Letter grades will be based on the following scale (in %)

A: 100 – 89% B: 89 – 79% C: 79 – 69% D: 69 – 58%

This scale will not go up, however it may change slightly if exams are curved.

Incomplete

A grade of “I” may be granted if a student is temporarily unable to complete course requirements because of unusual circumstances beyond the control of the student. This grade is NEVER given as a substitute for a failing grade or a withdrawal. An “I” will not be assigned for work that was due before the 10th week of the semester. Written requests for an “I” must be submitted PRIOR to the final exam.

TENTATIVE SCHEDULE

Week of	Text material/Topics	Laboratory Material
8/26-8/30	Introduction, Measurements, Tools of the Trade, Grav. Analysis – Ch. 0, 1, 6	Check-in, Calibrate glassware, Aspirin, Dry Cl sample (handouts)
9/4-9/6	Grav. Analysis, Tools of the Trade, Math Toolkit – Ch. 6, 2, 3	Percent Chloride (handout)
9/9-9/13	Math Toolkit, Statistics Ch. 3, 4	Percent Chloride, Prep. NaOH (23-6, p. 500)
9/16-9/20	Good Titrations, Intro. To Acids and Bases – Ch. 5, 7	Standardize NaOH (23-6) <i>aspirin is due</i>
9/23-9/27	<i>EXAM 1 (Sept. 23), Ch. 0, 1, 2, 3, 4, 6</i> Acids & Bases; Buffers – Ch. 7, 8	Acetic acid in Vinegar (handout) <i>Percent Chloride is due</i>
9/30-10/4	Buffers, Acid-base titrations, Polyprotic acids/bases – Ch. 8, 9, 10	Finish Vinegar <i>[NaOH] is due</i>
10/7-10/11	Polyprotics, EDTA titrations – Ch. 10, 12 <i>EXAM 2 (Oct. 11), Ch. 5, 7, 8, 9</i>	Potentiometric titration, pK _a (handout) get CaCO ₃ unknown, <i>Vinegar is due</i>
10/14-10/18	EDTA titrations, Electrode potentials Ch. 12, 13	EDTA-Ca titration (handout) <i>Turn in notebooks</i>
10/21-10/25	Electrode Potentials and Electrode Measurements – Ch. 13, 14	ISE of Fluoride (handout), Ash food <i>Potentiometric Titration is due</i>
10/28-11/1	Light and Spectrometry Ch. 17, 18	UV/VIS (23/19, p. 515) <i>EDTA-Ca is due</i>
11/4-11/8	Spectrometry – Ch. 18 <i>EXAM #3 (Nov. 6), Ch. 10, 12, 13, 14</i>	AAS of Copper (handout) <i>ISE is due</i>
11/11-11/15	Atomic Spectroscopy – Ch. 19 <i>Poster of UV-VIS presented Monday Nov. 11</i>	Finish Copper <i>Food/ UV-Vis is due</i>
11/18-11/22	Principles of Chromatography, Ch. 20	HPLC (handout) <i>Copper is due</i>
11/25	Gas & Liquid Chromatography, Ch. 21	no lab, Thanksgiving
12/2/12-6	Gas & Liquid Chromatography <i>Exam 4 (Dec. 2), Ch. 17, 18, 19</i>	HPLC (finish) <i>Notebooks and HPLC due Monday, December 9</i>

CUMULATIVE FINAL: Thursday, December 12, 2:00-3:50 p.m. in room 209 PAD