

Chemical Equilibrium and Analysis CHEM 212; Fall 2014



Course Name: CHEM 212, 4 credits
Prerequisites: CHEM 106X, MATH F107X or equivalent
Location: REIC 203 (lecture); REIC 245 (lab)
Meeting Time: MWF 9:15-10:15am (lecture); M 2:15-5:15pm (lab)
Final: Wednesday, Dec 17, 8-10am

Instructor: Dr. Sarah Hayes. Call me Dr. Hayes
Office: Reichardt, 188
Phone: 907-474-7118
Email: s.hayes@alaska.edu
Office Hours: M 10:30-11:30, By appointment, or drop by when my door is open

Blackboard Link: <http://classes.uaf.edu> *for grades only*
Class website: <http://analyticalchem.community.uaf.edu> *for all course content*
Req'd Materials: Harris, **Quantitative Chemical Analysis**, 8th ed. (978-1429218153)
Lab Notebook- bound notebook

Course Description: This course addresses aqueous chemical equilibrium as applied to chemical analysis, separations, spectrophotometry, potentiometry and factors considered in the analytical approach. Lab portion will include introductory experiments in analytical and instrumental techniques. CHEM 212 builds on previous experience with general chemistry (106X or equivalent).

Instructional Methods: This class will be taught in a “flipped” manner, meaning lectures are prerecorded on video, posted on the course website, and watched before class. Time during the class will be spent interacting with material through group work, solving problems, etc. Graded assignments are due daily, according to schedule posted on website.

Course Goals: Students will learn to understand statistical treatment of data, the calculations underlying chemical equilibrium, and analytical techniques: titrations, spectrophotometry, mass spectrometry, and separations.

Student Learning Outcomes:

- Students will become adept at statistical treatment of data and equilibrium calculations. *Don't be afraid of the math!*
- Students will be able to diagram, correctly apply, use, troubleshoot, and analyze data from a variety of spectroscopic and chromatographic instrumentation. *Instruments are super cool! Let's learn how they work!*

Course Policies:

The policies outlined in this syllabus represent a social contract and continued attendance indicates that you agree to abide by all course policies.

Classroom Behavior and Collaboration - CHEM 212 is part of a professional training program and students are expected to conduct themselves accordingly. Students are expected to attend class

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and not compromise the experience of other students. Disrespect of the classroom learning environment, instructors, and fellow students will not be tolerated! Collaboration and working in small groups is a key component of classroom and lab time. Your group is there to support your learning, not do the work for you, thus copying is not acceptable. The instructor reserves the right to dismiss students who are not actively participating in lab or lecture for the remainder of the period and students will automatically receive a grade of zero for any graded content during the period.

Late work and makeup labs- Late work is not accepted. This is in an effort to keep us all moving though the material efficiently. Furthermore, makeup labs will only be allowed in the case of University excused absences.

Honor code and Academic integrity- Students are expected to conduct themselves in accordance with the UAF Honor code. The Chemistry Department policy states: Any student caught cheating will be assigned a course grade of F. The student's academic advisor will be notified of this failing grade and the student will not be allowed to drop the course. In CHEM 212, this policy will be applied to any graded assignment (exams, activities, labs, homework, etc.) where the work has been copied from a peer, solutions manual, online resource, etc.

Disability Services- I will work with the Office of Disabilities Services (208 Whitaker Bldg, 474-5655) to provide reasonable accommodation to students with disabilities. It is the student's responsibility to make an appointment with me to discuss appropriate accommodations. A letter from disabilities services must be provided.

Instructor-Initiated Withdrawals- Any time up to and including Friday, **October 31**, the professor has the right to withdraw a student that "...has not participated substantially in the course." In CHEM 212 nonparticipation includes: (1) Exam I or II is missed without an excused absence, or (2) one or more labs are missed, or (3) the student shows poor class attendance (missing more than 1/3 classes), or (4) does not participate during class time, or (5) is has turned in less than 2/3 of "homework" assignments including class preparation and/or in class assignments.

Course Evaluation:

Grades are assigned on the typical scale 90-100 A, 80-90 B, 70-80 C, etc.

Hour exams	5 x 100 pts (your 3 highest grades and final count)	400
Labs	7 x 40 pts; 1 x 20 pts	300
Homework, quizzes & in-class work	~30 x 10 pts normalized to 300 pts	300
Total points		1000

Exams- Four hourly exams are scheduled and I will average the three highest scores. The final exam is mandatory and cumulative.

Labs- Eight labs will be performed during the semester. The first seven will be worth up to 40 points, preparation for the last lab will be worth 20 pts (no writeup required). See attached sheet for lab information and schedule.

Homework- Students are expected to watch online lectures BEFORE class, take notes, and do associated problems. These will be turned in at the beginning of each class.

In class work- The bulk of class time will be used for individual and group work. Arriving to class prepared and **ACTIVE** participation is required! Work will be turned in and evaluated. **Bring your notes, a calculator, and a good attitude to class.**

See the course website for:

Up to date class and lab schedule

Materials for each day of class- videos, assignments, tutorials, items due, etc

Lab materials

Grading rubrics

Course syllabus

Tentative course schedule:

A more detailed schedule is maintained on the course website:

<http://analyticalchem.community.uaf.edu>.

Unit 1: Data Treatment (Ch. 0-5)

~10 days

Error and error propagation

Statistical treatment of data

Calibration Techniques

Quality Control and Quality Assurance

Gravimetric analysis

Unit 2: Equilibrium (Ch. 6-11)

~11 days

Solubility

Acid-Base

Chelation

Unit 3: Instrumentation 1 (Ch. 13-20)

~9 days

Electrochemistry

Spectrophotometry

Unit 4: Instrumentation 2 (Ch. 20-25)

~7 days

Mass spectrometry

Separations/ chromatography

CHEM 212 Laboratory

TA Instructor: Nicole Knight
Contact info: NKnight9@alaska.edu
Availability: By appointment arranged by email.

Tentative Schedule

Week	Experiment
1	Analytical measurements
2	Ni determination by calibration curve
3	Ni determination by standard addition
4	Weight % of copper in pennies
5	Weight % of copper in pennies
6	Weight % of copper in pennies
7	Fe redox titration
8	Fe redox titration
9	UV-Vis
10	FT-IR
11	Caffeine by HPLC
12	Caffeine by HPLC, Cocaine and currency
13	Cocaine and currency
14	Wrap up

Lab Policies:

Safety- All students are expected to work within given safety guidelines and use common sense. Safety instructions will be given by the instructor or TA and must be followed. See next sheet for additional lab safety guidelines.

Makeup labs- Makeups are not available in this course, except in instances of school-related travel. This is because there is only one lab section of this course and makeup labs require significant amounts of extra time for the TA and instructor.

Laboratory Evaluation: Lab write-ups are due the Monday after the exp. is completed.

Please visit course website for additional information, including: example lab write-ups, example grading rubrics, and other helpful materials.

Prelab (10/40 pts)- Students are required to prepare for each experiment before class. This includes, reading the lab, outlining the procedure in their lab notebook, and preparing data tables.

Accuracy and Precision of measurements (10/40 pts)- You are evaluated on the accuracy and precision of your experimental results in this course. Attention to detail and careful measurements are essential to success.

Lab write-ups (20/40 pts)- Students are evaluated on their writing skills as well as the analysis and interpretation of experimental results.

CHEM 212 Skills: Specific skills learned in CHEM 212 include: lab safety, micro pipetting technique, titrations, acid digestion, analytical dilutions by mass, estimation of random error in analytical measurements, and detection of systematic errors in measurements. Students are also exposed to a variety of instrumentation, including: UV-Visible absorption and fluorescence molecular spectroscopy, Flame Atomic Absorption (AA), Fourier Transform-Infrared spectroscopy (FT-IR), High Performance Liquid Chromatography (HPLC), Gas Chromatography-Mass Spectrometry (GC-MS).

LABORATORY RULES

1. Understand the experiment before beginning work. If in doubt, ask for help.
2. Safety glasses or goggles are to be worn at all times in the laboratory.
3. Dress appropriately. Your clothing is a barrier between your skin and potentially hazardous chemicals. Shirts and shoes are required. Shorts, short skirts, open-toed shoes, sandals, and midriff shirts are not allowed. Avoid floppy or extremely loose clothing. Secure long hair and loose sleeves with rubber bands or sleeve protectors.
4. Outer-wear clothing and book bags, etc. should be hung on the coat racks or placed in the cabinets provided in the lab.
5. No chewing gum, no using smokeless tobacco products, and no eating or drinking food or beverages of any kind in the lab. No smoking or drinking anywhere in the building.
6. No storing food or beverages of any kind in the lab.
7. Lab drawers should be kept closed when you are not removing items from them.
8. Keep glassware to the back of the bench.
9. Pipets, thermometers and burets should always be placed so they cannot roll off the bench.
10. Do not attempt any unauthorized procedures. No horseplay or practical jokes.
11. Working alone in the lab is prohibited. An instructor must always be present.
12. If chemicals contact your skin, rinse immediately and thoroughly with cold water. Tell your TA immediately. Never touch your eyes or your mouth unless you KNOW your hands are clean. Wash your hands before leaving the laboratory.
13. Consider all chemicals hazardous. Never taste any chemical or inhale any vapor.
14. When working in the fume hood, keep the sash as low as possible. All chemicals should be kept at least 6 inches from the front of the hood.
15. Keep the lab clean and the floor dry. Wipe up any spills or broken glass immediately. Use spill absorbent or acid neutralizer on chemical spills. Broken glass is deposited in the glass trash only. Do not throw glassware contaminated with chemicals in the broken glass box.
16. No one who appears under the influence of drugs or alcohol will be permitted in the lab.
17. No children or visitors not enrolled in this course are permitted in the lab.
18. Please bring any safety concerns to your TA. Notify him/her immediately in case of an accident, however minor. Also, be alert to the possibility of an accident by your neighbors. You could be a victim of their mistakes.