

CHEM 621: Analytical Chemistry Laboratory Fall 2017

COURSE INFORMATION

Instructor Professor Michael Johnson
Malott 3071
864-4269
johnsonm@ku.edu
Office hours: TBA

Lab Director Dr. Travis Witte
Malott 3025
864-3903
tmwitte@ku.edu

Teaching Assistants and Email Addresses

Sasanka Ulapane	Dhanushka Weerasekara	Emily Kurfman
sasanka87@ku.edu	d703w320@ku.edu	ekurfman@ku.edu

Lecture Monday 2:00-2:50 PM, Malott 2048

Lab sessions Tuesday 8:00-11:50 AM, 1:00-4:50 PM; or Wednesday 1:00-4:50 PM; or Thursday 8:00-11:50 AM, 1:00-4:50 PM, or Friday 1:00-4:50 PM; Malott Hall 3024

Required Materials *Quantitative Chemical Analysis*, D. C. Harris, 9th ed.
A scientific calculator capable of calculating mean and standard deviation
Safety goggles (Chemistry Department Approved)
Laboratory notebook (see below for details)

Optional Materials If you own a laptop with Microsoft Excel, you are encouraged to bring it to lab to analyze your data. **BUT MAKE SURE YOU PUT YOUR DATA IN YOUR NOTEBOOK**

Prerequisites CHEM 188, (CHEM 622 or CHEM 624), CHEM 625, and concurrent enrollment in CHEM 620
Course site Log in to Blackboard at <http://courseware.ku.edu/>

OBJECTIVES

The lab and associated lecture have the following learning objectives.

1. Learn about the principles and use of the instruments of chemical analysis, from basic glassware to modern instrumentation.
2. Learn to evaluate confidence through statistical and error analysis methods.
3. Learn to use various calibration methods.
4. Learn to maintain a research-quality lab notebook.
5. Learn to communicate scientific findings through the writing of technical reports.

EVALUATION

All assignments will be graded on a points system. Grades will be rounded to the nearest tenth of a point. Borderline grades will count as the *higher* grade (e.g., 83.0% is a B).

A	93-100	B+	86-90	C+	76-80	D+	66-70	F	0-60
A-	90-93	B	83-86	C	73-76	D	63-66		
		B-	80-83	C-	70-73	D-	60-63		

LABORATORY REPORTS

Being able to present laboratory results in formal reports is an essential skill in science. Therefore, laboratory reports will be required. They will be written in the format of the provided sample report. More information on the lab reports will be provided on a separate attachment.

Citations and References: When you use a source in your report, you must include both a citation in the text itself (a number in square brackets), and a reference at the end of the text. If you cite the same source again, reuse the number. Examples, adhering to the format used by the journal *Analytical Chemistry*, follow.

Web citation:

Author's Guide to Analytical Chemistry, http://pubs.acs.org/paragonplus/submission/anchem/anchem_authguide.pdf [accessed 8/14/2007].

Book citation:

Harris, D. C. *Quantitative Chemical Analysis*, 9th ed.

Journal article:

Astorga-Wells, J.; Vollmer, S.; Bergman, T.; Jornvall, H. *Analytical Biochemistry* **2005**, *345*, 10-17.

Lab handout:

Determination of Atrazine by Gas Chromatography/Mass Spectrometry (GC/MS), CHEM 621 Lab Handout, Department of Chemistry, University of Kansas, 2017.

LABORATORY NOTEBOOKS

Maintaining a well-organized notebook that documents your work is essential in all scientific pursuits. **To encourage good notebook skills, your TA will check your notebook and assign you points based on the quality of your notebook. This will be part of your final grade.**

You will need a laboratory notebook that **incorporates a carbon or carbonless duplicate** of each page. Write your name and address or phone number inside the cover so that if the lab notebook is left in lab or lost it can be returned. The duplicate pages of your notebook will be collected at the end of each lab.

Data Entry: All data entered into a laboratory notebook must be in blue or black ink and must be legible to others. **Record the data as you collect it.** Do not transfer data from scraps of paper carried around the laboratory. If a mistake is made draw a single line through the error and ensure that it is still legible. This is a process of learning to create a legal document – in the chemical industry laboratory notebooks frequently are key parts of intellectual property proceedings. Any computer-generated data (charts, graphs, spectra, etc.) should be printed out and permanently attached to your notebook with glue or staples. You do not need to include the data with the duplicate page.

Calculations: Even if using a calculator or computer to carry out calculations you should document the calculation in the lab notebook. This should be done clearly and without ignoring steps so that another experimenter can duplicate the work. It is considered good laboratory practice to perform necessary calculations when following the lab procedure. This will enable you to arrive at a solution before the experiment is disassembled and reagents discarded.

Graphs: One of the best tips to understanding the results is to graph the data as it is collected. A rough graph, sketched in the lab notebook, can be used to interpret the data and determine validity of the results before leaving the laboratory. Is the plot what was expected? Is a data point far off of the expected curve? Plotting as the data is collected will enable the experimenter to repeat measurements that appear to have associated errors and enable one to discard erroneous results.

SPECIFIC COURSE POLICIES

Access to education: The KU office of Disability Resources coordinates accommodations and services for all students who are eligible. If you have a disability for which you wish to request accommodations and have not contacted DR, please do so as soon as possible. Their office is located in 22 Strong Hall; their phone number is 785-864-2620 (V/TTY). Information about their services can be found at <http://disability.ku.edu>. Please also contact the instructor privately with regard to your needs in this course.

Blackboard interruptions: Many of your assignments must be submitted via Blackboard. In the event of long unscheduled outages, the instructor will change assignment due dates and/or submission formats. Please note that no adjustments will be made for *scheduled* service interruptions.

Changes in course schedule or policy: These policies and schedule are subject to change in the event of extenuating circumstances. Any changes in schedule or structure of the course will be announced in class and on Blackboard.

Interruption of lab or exam: If a lab or examination period is interrupted due to closure of the University or other occurrence, the instructor reserves sole discretion to determine how the interruption will be corrected. You should assume that an interrupted exam will be re-administered at the next regularly scheduled class meeting.

Lab absences: Due to extremely high enrollment in this course this year, make up labs will only be accommodated in cases of extreme circumstances. The possibility to make up a lab will be decided by the instructor following consultation with the TAs and lab director. Written documentation concerning the nature of the absence is also required and must be provided to the instructor within a week of the absence.

Lab check-out: You are required to complete a clean-up and check-out of lab on or before your final scheduled lab period. This policy applies even to students who have dropped or withdrawn from the course. Students who do not complete a check-out will be charged \$15 for clean-up and \$25 for a replacement locker key. In addition, you must settle any breakage charges prior to the final exam. Failure to pay this bill will result in an incomplete (for enrolled students) and be reported to the University Billing Office. The unpaid balance may interfere with some of your University services.

Lab Glassware: The student is responsible for the cost of replacing lost or broken glassware. Note that some of the specialized glassware used in the laboratory can be quite expensive.

Lab safety: Your safety is of utmost priority in the laboratory. If you behave in an unsafe manner, you will receive a verbal warning from the TA, instructor, or staff member. If the unsafe behavior continues, you will be dismissed from the lab. If you appear to be a danger to yourself or others you will also be dismissed from lab. Goggles must be worn at all times in the laboratory. If you are dismissed, readmission is only possible after you have completed a safety review conference with your TA and instructor.

Late work: Your report grade will be reduced by 5% for each day that the report is late. Hard copies of reports are due at the beginning of the lab period. You may not print your report in lab.

Privacy and tracking notice: Blackboard may automatically record student activities, including but not limited to: your first and last access to the course, number of times you have accessed the course, pages you have accessed, the number of discussion messages you have read and sent, posted discussion messages, and chat room text. This data may be accessed by the instructor for instructional purposes.

Withdrawals: You may withdraw from this course without evaluation of your grade through 14 September 2014. From 15 September to 18 November 2015, you may withdraw with a grade of W. You may not withdraw from the course after 18 November 2015.

Work outside of scheduled lab period: Work outside of your scheduled lab period is only permitted with the permission of the instructor and will only be permitted under exceptional circumstances. Under no circumstances can you work in lab without the presence of a TA, instructor, or qualified staff member.

ACADEMIC INTEGRITY

You are expected to maintain the highest standards of honesty and integrity in your work in this course. Behavior that deviates from these standards will be dealt with as laid out in the University Senate Rules and Regulations (Article II, Section 6, <http://policy.ku.edu/governance/USRR#art2sect6>). For the purposes of this course, academic misconduct includes, but is not limited to: sharing or receiving unauthorized information during an exam; fabricating or altering data; claiming the data of another as your own; sabotage; plagiarism; aiding or abetting the misconduct of others; and dishonesty in dealing with TAs, staff, or instructor. **At the very minimum, you will receive a grade of zero on any work in which you violate these integrity standards, more serious violations will result in failure in the course and be reported to the Dean of the College of Liberal Arts and Sciences.**

Plagiarism: Obviously, copying the text of someone else's lab report (including those that you peer review) is academic misconduct and will be dealt with appropriately. But also exercise great care in the writing of your report to ensure that you do not plagiarize either the lab handout or your class mates. A key step in the learning process is learning to express technical concepts in your own words. Beware of closely paraphrasing the lab handout!

Data manipulation: The alteration, omission, or fabrication of experimental data is the most serious offense any scientist can commit. Any of these behaviors will be considered a serious violation of the academic integrity policies and will be dealt with accordingly.

Teamwork: During many of the labs this semester, you will be working as a member of a team. While you will be sharing your labor and data with your partners, team writing of reports or sharing reports with team members is expressly prohibited and will be considered an act of plagiarism on the part of all who are involved.

IMPORTANT! POLICY REGARDING CONCEALED CARRY OF FIREARMS

If you carry a concealed firearm, it is imperative that precautions are taken to ensure the safety of yourself and others. For details regarding the concealed carry of firearms on the KU campus, please reference the KU weapons policy at <http://policy.ku.edu/university-kansas-policy-weapons-including-firearms-effective-july-1-2017>.

Also, please note the following change in policy, which has been approved by the KU Office of General Counsel:

All bags, purses, backpacks, etc. are to be stowed in designated areas before laboratory sessions begin. Students who carry a handgun in a purse or backpack (pursuant to state law - K.S.A. 75-7c20) will either have to transfer the handgun to a concealed holster on their body, or transfer the firearm to a secure location, such as a gun safe in their residence or the trunk of their locked vehicle prior to class.

COURSE SCHEDULE

Week of	Lecture (Monday 2-2:50 PM)	Lab (Tuesday, Wednesday, Thursday or Friday)
8/22	Course introduction	No labs
8/29	Introduction to analytical and spectroscopy measurements	Check-in and lab safety
9/5	Labor Day (No class)	1. UV-Vis determination of dyes
9/12	Spectroscopy, Standard deviation, linear regression	2. Fluorometric determination of quinine in tonic water
9/19	Equilibrium in solution and equilibrium constants	3. Spectrophotometric determination of the pK_a of bromothymol blue
9/26	Buffers and Chromatography	4. Determination of the active ingredients in an over-the-counter pharmaceutical by HPLC
10/3	Chromatography continued	4. Determination of the active ingredients in an over-the-counter pharmaceutical by HPLC
10/10	Fall break, no lecture	Fall break, no labs
10/17	Voltammetry and standard addition	Lab Rotations (see lab rotation schedule)
10/24	GC/MS and internal standards	Lab Rotations (see lab rotation schedule)
10/31	Atomic spectroscopy	Lab Rotations (see lab rotation schedule)
11/7	Laboratory Report preparation	Lab Rotations (see lab rotation schedule)
11/14	Multivariate analysis	Lab Rotations (see lab rotation schedule)
11/21	TBA	Thanksgiving break, no labs
11/28	TBA	Lab Rotations (see lab rotation schedule)
12/5	TBA	No labs

Rotation labs: Determination of lead in brass by atomic absorption, Gas chromatography/mass spectrometric determination of atrazine in water, Determination of lead in water by anodic stripping voltammetry

