

CHEM 620: Analytical Chemistry

Fall 2017

COURSE INFORMATION

Instructor:	Prof. Yong Zeng 3027 Malott Hall 864-8105 yongz@ku.edu
Office Hours:	appointments granted upon request
Class Meetings:	Mon, Wed, Fri, 10:00-10:50 AM, 2001 Malott
Required materials:	<i>Quantitative Chemical Analysis</i> , 9 th ed., by Daniel C. Harris scientific calculator Sapling online homework
Prerequisites:	One semester of organic chemistry and one semester of organic chemistry laboratory or permission of instructor
Co-requisites:	CHEM 621, Analytical Chemistry
Lab Course website:	http://courseware.ku.edu/

OBJECTIVES

The goal of this course is to introduce you to the major principles of analytical chemistry with emphasis on the fundamental methods used for chemical analysis. The focus is on three important aspects: how to design experiments, how to analyze data, and how the tools of measurement work. The objectives of the course are

1. Learn how to apply the *analytical approach* to answer scientific questions.
2. Learn how to evaluate confidence through statistical and error analysis methods.
3. Understand the principles and use of the instruments of chemical analysis, from basic glassware to modern instruments.

EVALUATION

Pre-class reading quizzes (5%). Short open book, online quizzes on the assigned readings will precede most class meetings. These quizzes will close at the start of class.

In-class quiz (15%). 8-10 short quizzes will be given at the class meetings. The quizzes will be closely related to assigned homework. Your lowest two quiz grades will be automatically dropped when your final grade is calculated.

On-line Homework (25%). Homework assignments will be given after most class meetings through Sapling Learning, an online homework system. In general, you will have several attempts (up to three) to correctly answer each question, though there will be a deduction (10%) for each incorrect attempt. Homework will be due at the beginning of the next class meeting.

Exams (55%). Three exams will be given. Exams 1 and 2 weigh 15% each, and Final Exam (cumulative) weighs 25%. No make-up exam will be given.

Grading scale. All grade calculations will be done on a percentage basis. The final grade will be a weighted average of the all components. The University's grading scale will be followed to assign the letter grades.

COURSE POLICIES

Attendance: Attendance will not be recorded. All graded work (i.e., quiz, homework, and exams) will be given during class and based on the information covered in the lectures. It is therefore to your advantage to attend all lectures. The instructor will not provide notes, handouts, or other materials for students who miss a class except the on-line materials. Please silence cell phones before coming into the class.

Missed in-class quizzes and exams: There will be **NO make-ups** for missed in-class quizzes and exams. Your two lowest in-class quiz grades will be dropped automatically when your final grade is calculated. The score drops enable you to miss **TWO** quizzes for any reason that you think is important. No explanation or documentation is required. Reserve these opportunities for an illness or other serious matters. If you need to be absent from an exam or quiz for university business or a religious observance, please discuss this with the instructor **at least two weeks in advance**. If you have to be absent from an exam or quiz due to medical emergency, please inform the instructor **in advance** and provide the doctor's note afterward. Once permitted, the grade for the missed exam will be replaced by the average grade of your other exams. Job interviews, major family events, interviews for medical school, attending a conference, *etc.*, will not be excused.

Missed or late homework and pre-class quizzes: Late homework, or missed quiz/exam will not receive credit. **Two** lowest grades for homework and pre-class quizzes will be automatically dropped.

Some of your lowest grades are automatically dropped before your grade is calculated. This builds in automatic excused absences for you. The following table summarizes how this will work.

Item	Makeup/late/absence policy
Exam	No makeups
In-class quiz	Two lowest scores dropped, no makeups
Pre-class quiz	Two lowest scores dropped, no makeups
Homework	Two lowest scores dropped, no makeups

Identification: You may be required to present your KU-issued ID to an exam proctor when submitting your exam.

Electronic interruptions: In the event of major, wide-scale disruptions of electronic resources such as Blackboard or Sapling, deadlines may be extended or assignments may be cancelled or treated as optional.

Benevolent dictator clause: The instructor is a benevolent dictator in this course and reserves the right to change the structure, the content, the criteria for evaluation, and the assignments for reasons that he decides are in the best interest of student learning. Such changes will not be made capriciously. Any changes in schedule or structure of the course will be announced in class and on Blackboard.

Withdrawals: The University's timeline for course withdrawals will be followed.

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://www2.ku.edu/~unigov/usrr.html>). For the purposes of this course, academic misconduct includes, but is not limited to: providing or obtaining unauthorized information on an assignment or an exam; fabricating information; claiming the work of another as your own; sabotage; plagiarism; aiding or abetting the misconduct of others; and dishonesty. *At the very minimum, you will receive a grade of zero on any work in which you violate these integrity standards and all violations will be reported to the appropriate University officials.* The instructor reserves the right to retain copies of all submitted work.

Concealed carry: Individuals who choose to carry concealed handguns are solely responsible to do so in a safe and secure manner in strict conformity with [state and federal laws](#) and [KU weapons policy](#). Safety measures outlined in the KU weapons policy specify that a concealed handgun:

- Must be under the constant control of the carrier.

- Must be out of view, concealed either on the body of the carrier, or backpack, purse, or bag that remains under the carrier's custody and control.
- Must be in a holster that covers the trigger area and secures any external hammer in an un-cocked position
- Must have the safety on, and have no round in the chamber.

Instructors are allowed by Kansas Board of Regents policy, to require backpacks, purses and other bags be placed away from the seats during exams and quizzes, and as such those items will not be under the constant control of the individual. Students who choose to carry a concealed handgun in a purse, backpack, or bag must review and plan each day accordingly, and are responsible for making alternate arrangements as necessary. The university does not provide appropriate secured storage for concealed handguns.

Individuals who violate the KU weapons policy may be asked to leave campus with the weapon and may face disciplinary action under the appropriate university code of conduct.

Evacuations during examinations: The KU Office of Public Safety and the Office of the University Registrar have developed a system to identify replacement classrooms in the event that evacuation is necessary while an examination is in progress or is scheduled to be administered. Scheduled examinations will not be canceled in the event of building evacuations.

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>. You may also contact the instructor privately with regard to your needs in this course.

Recording of lectures: Course materials prepared by the instructor, together with the content of all lectures and review sessions presented by the instructor, are the property of the instructor. Video and audio recording of lectures and review sessions without the consent of the instructor are prohibited. Upon request, the instructor will usually grant permission for students to make audio recordings of lectures, on the condition that such recordings are only used as a study aid by the individual student making the recording. Unless explicit permission is obtained from the instructor, such recordings may not be modified and must not be transferred or transmitted to any other person, whether or not that person is enrolled in the course.

Privacy and tracking notice: Electronic resources used in this course, such as Blackboard and Sapling, 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 can be accessed by the instructor.

TIPS FOR SUCCESS IN THIS CLASS

Be prepared. You should prepare for each lecture by reading the relevant chapter before class (see the lecture schedule).

Progress consistently. Be sure to **study** the materials and **work** problems after each lecture as they are meant to reinforce your understanding of the lecture material. Work extra problems for each chapter in addition to the homework assignments. The more problems you practice, the better you will understand the material. Try to do problems without the aid of lecture notes or other references (e.g., solutions manual) so that you can properly assess how well you understand the material. If you find yourself constantly turning to the lecture notes or solution manual, then you aren't doing enough pre- and post-class reading or studying class notes. Try to avoid working problems to just get an answer; focus on understanding the concepts behind each problem.

Keep up communications. Talk to the instructor and TA if you have any comment, suggestion, concern and problem regarding the lectures, course materials, and your study experience, etc.

TENTATIVE COURSE SCHEDULE

Date	Topic	Chapters
21-Aug	Course introduction	
23-Aug	Introduction to Chemical Analysis	0, 1
25-Aug	Significant figures, Experimental error	3
28-Aug	Experimental error propagation	3
30-Aug	Online HW website practice, self-reading, self-learning of Excel	Sapling Learning, 0-2
1-Sep	Statistics-Gaussian distribution, standard deviations	4
4-Sep	Labor Day	
6-Sep	Confidence intervals, Null hypothesis, Student's <i>t</i> test	4
8-Sep	<i>p</i> -value, Grubb's test, Linear least squares	4, 5
11-Sep	Calibration methods, Method validation	5
13-Sep	Sampling and Standards	28
15-Sep	Quantitative Chemical Reactions and Equilibrium	6, 8
18-Sep	Monoprotic Acid-Base Equilibria, Graphical Methods	9
20-Sep	Guest lecture (Dr. Mei He)	
22-Sep	Review and practice	
25-Sep	Exam 1	
27-Sep	Polyprotic Acids, Bases, and Buffers	10
29-Sep	Acid-Base Titrations	11
2-Oct	Metal-ion Complexation Reactions and Titrations	12
4-Oct	Properties of electromagnetic waves	18
6-Oct	Absorption of light	18
9-Oct	Luminescence	19
11-Oct	Spectrophotometric methods of analysis	19
13-Oct	Spectrophotometers	20
16-Oct	Fall Break	
18-Oct	Atomic Spectroscopy	21
20-Oct	Atomic Spectroscopy	21
23-Oct	Review and practice	
25-Oct	Exam 2	
27-Oct	Introduction to Chemical Separations	23
30-Oct	Chromatography	23
1-Nov	Band broadening	23
3-Nov	No lecture, material reading	
7-Nov	Gas chromatography	24
9-Nov	HPLC theory, method development	25
11-Nov	Mass spectrometry and HPLC-MS	25, 22
14-Nov	Other liquid chromatographic Methods	26
16-Nov	Electrophoresis theory	26
18-Nov	Capillary and other electrophoresis methods	26
20-Nov	Oxidation-Reduction Reactions	14
22-Nov	Thanksgiving Break	
24-Nov	Thanksgiving Break	
27-Nov	Electrochemical cells	14
29-Nov	Electrodes and Potentiometry	15
1-Dec	Electroanalytical techniques	17
4-Dec	Electroanalytical techniques	17
6-Dec	Review and practice	
8-Dec	Stop Day	
13-Dec	Final Exam, 7:30-10:00 AM, in regular classroom	Cumulative