

LOYOLA UNIVERSITY CHICAGO
DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY
CHEM 260 – Quantitative Methods in Chemistry
SYLLABUS, SPRING 2024

<u>Instructor:</u>	Dr. Joerg Zimmermann	<u>phone (office):</u>	(773) 508 3117
<u>Office Hours:</u>	Mon 9:15 to 10:15 AM or by appointment (location: Flanner Hall 418 or zoom)	<u>phone (cell):</u>	(858) 405 7026
<u>e-mail:</u>	jzimmermann@luc.edu	<u>Course Website:</u>	sakai.luc.edu

COURSE DESCRIPTION

Lecture and discussion course designed to create foundational knowledge and proficiency in essential chemistry concepts and skills. Topics include quantitative description of gases, liquids, and solutions, kinetics of chemical reactions, chemical equilibria, acids and bases, the thermodynamics of chemical reactions, electrochemistry, and spectroscopy.

PREREQUISITES/COREQUISITES

CHEM 180, CHEM 181 and (MATH 131 or MATH 161), Pre-requisite for BIOI-BS majors: CHEM 180 and (MATH 131 or MATH 161).

COURSE FORMAT

Lecture (MoWeFri 8:15 AM – 9:05 AM, Flanner Hall Auditorium), Discussion (section I: Fr 9:20 AM – 10:10 AM, Flanner Hall 105, section II: Fr 10:25 AM – 11:15 AM, Flanner Hall 105).

PREFERRED NAME AND GENDER PRONOUN

This course affirms people of all gender expressions and gender identities. If you prefer a different name or pronoun than what is indicated on the class roster, please let me know. Please correct me on your preferred name and gender pronouns. If you have any questions or concerns, please do not hesitate to contact me.

OFFICE HOURS

Office hours are for those with questions, who seek advice, want to share and/or provide feedback. You can “walk in” or make an appointment ahead of time. Discussion can be about this class and beyond – office hours are for EVERYONE. We can talk about college life in general, class work, class issues, your academic plans, schedules, grades, a letter of recommendation you may need, or general questions or concerns. If you are unable to attend the regular office hours, I am happy to meet at a time that works for you, just ask me (either in person or via email).

As family matters, assignments, essays, and tests in all of your courses demand your attention, there could be moments when you need assistance. If you are experiencing difficulties inside or outside the classroom that may affect your performance in this course, I WANT TO HEAR ABOUT IT. I will do my best to accommodate your specific needs to help you succeed.

COMMUNICATION OUTSIDE OF CLASS TIME AND OFFICE HOURS

Course-related communications between you and me are best conducted via email, using the Loyola email account. Avoid using personal email accounts, I may not receive those emails due to spam filters. Check your email often, AT LEAST ONCE A DAY. You can also call or text me at my cell-phone number: (858) 405 7026.

CLASS BEHAVIORAL EXPECTATIONS

We strive for a learning environment of equity, respect, and inclusiveness. Therefore, all of us are expected to follow these basic principles:

- Demonstrate respect for oneself and for others.
- Treat others with dignity and behave in a way which promotes a physically and psychologically safe, secure, and supportive climate.
- Allow all community members to engage as full and active participants where the free flow of ideas is encouraged and affirmed.

COURSE LEARNING OUTCOMES

Students will deepen their understanding of foundational concepts of chemistry and advance their skills in scientific problem solving, critical thinking, and synthesis of concepts, with specific emphasis on applying mathematical models to the properties of matter and chemical reactions. After successfully completing this course, students will be able to

- apply the perfect gas laws, connect the molecular properties of gases to macroscopic observables, and understand deviations of real gases from the behavior of perfect gases,
- describe reaction kinetics using instantaneous and integrated rate laws, and describe the temperature-dependency of reaction rates using the Arrhenius equation,
- describe chemical equilibria via equilibrium expressions, reaction quotients, and ICE tables,
- calculate the pH of solutions of strong and weak acids or bases and buffer solutions,
- predict buffer action to neutralize strong acids or bases,
- describe titrations of strong or weak acids or bases with strong acids or bases,
- describe the solubility of salts and the common-ion effect,
- describe the thermodynamics of chemical reactions using the concepts of free energy, entropy, and enthalpy, heats of formation, and bond dissociation energies,
- describe chemical equilibria using standard free energies of reaction,
- describe the behavior of liquids and solutions, including colligative properties, using thermodynamic models,
- predict the outcome of redox reactions under standard and nonstandard conditions using standard cell potentials,
- have a basic understanding of UV/vis and fluorescence spectroscopy.

CAMPUS RESOURCES

Loyola University is dedicated to helping students succeed in their education endeavors. There are many resources to assist you with your courses. You can find brief descriptions of the various types of support with links to the respective pages, as well as quick links to each, at <https://www.luc.edu/sas>.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Loyola University Chicago provides reasonable accommodations for students with disabilities. Any student requesting accommodations related to a disability or other condition is required to register with the Student Accessibility Center (SAC). Professors will receive an accommodation notification from SAC, preferably within the first two weeks of class. Students are encouraged to meet with their professor individually in order to discuss their accommodations. All information will remain confidential. Please note that in this class, software may be used to audio record class lectures in order to provide equitable access to students with disabilities. Students approved for this accommodation use recordings for their personal study only and recordings may not be shared with other people or used in any way against the faculty member, other lecturers, or students whose classroom comments are recorded as part of the class activity. Recordings are deleted at the end of the semester. For more information about registering with SAC or questions about accommodations, please contact SAC at 773-508-3700 or SAC@luc.edu.

COURSE MATERIALS

1. **Enrollment in WileyPlus for textbook and online homework system** (instructions are posted on Sakai).
2. **Enrollment in TopHat for in-class polling** (instructions are posted on Sakai)
3. **A device with web browsing capability** (e.g. cell phone, tablet, laptop) for in-class activities.
4. **Access to your LUC email and the course website** (Sakai). Check here often for general information, announcements, discussion forums, and grades. **YOU ARE RESPONSIBLE TO BE AWARE, WITHIN 24 HOURS, OF ALL EMAILS SENT TO YOUR LUC ACCOUNT, ANNOUNCEMENTS MADE ON THE COURSE.WEBSITE AND FOR ALL MATERIALS PLACED THERE.**

ACADEMIC CALENDAR

You are responsible for understanding all processes and timelines associated with dropping or withdrawing from this course, file for a PASS/FAIL conversion etc. The Loyola University Chicago academic calendar that lists important dates and deadlines for the semester can be found at <https://www.luc.edu/academics/schedules>.

PASS/FAIL CONVERSION DEADLINES AND AUDIT POLICY

A student may request to convert a course into or out of the "Pass/No-Pass" or "Audit" status usually only within the first two weeks of the semester (check the Academic Calendar for the actual deadline this semester). Students must submit a request for Pass/No-Pass or Audit to their Academic Advisor.

COURSE REPEAT RULE

Effective with the Fall 2017 semester, students are allowed only THREE attempts to pass Chemistry courses with a C- or better grade. The three attempts include withdrawals (W). The Department advises that it is preferable to complete a course with a grade of C or C-, and to demonstrate growth in future coursework, than to withdraw from a course.

After the second attempt, the student must secure approval for a third attempt. Students must come to the Chemistry Department, fill out a permission to register form or print it from the Department of Chemistry & Biochemistry website: <https://www.luc.edu/chemistry/forms/> and personally meet and obtain a signature from either the Undergraduate Program Director, Assistant Chairperson, or Chairperson in Chemistry. A copy of this form is then taken to your Academic Advisor in Sullivan to secure final permission for the attempt.

LATE/MISSED WORK

Assignment deadlines are firm. Assume that technology will fail sometimes. Do not assume that everything will go smoothly when it comes to computers. Plan ahead. Do not leave completion/submission of assignments to the last possible moment. If you miss an assignment, contact the instructor as soon as possible, but not later than 48 hours after the assignment's deadline and state the reason for the missed deadline. Accommodations will be provided at the discretion of the instructor on a case-by-case basis in cases of emergency circumstances (e.g. serious illness, accidents, caring for a child or other family member).

ACADEMIC INTEGRITY

Before beginning, let me state EMPHATICALLY that I firmly believe that 99.9% of my students (if not 100%) are basically honest people. I also know that the pressures of school, grades, family, etc. can be overwhelming at times and can lead to choices one would not normally make. That said, I view violations of Academic Integrity as a very serious offense against your fellow students and against the integrity of the university, as well as a personal affront to me. There will be zero tolerance for infractions. If you believe there has been an infraction by someone in the class, please bring it to my attention. If caught, I will pursue disciplinary action against all parties TO THE FULLEST EXTENT POSSIBLE; this may include lowering of grades, failure, suspension or expulsion.

Academic dishonesty can take several forms, including, but not limited to cheating, plagiarism, copying another student's work, and submitting false documents. All students in this course are expected to have read and to abide by the demanding standard of personal honesty, drafted by the College of Arts & Sciences, which can be viewed here: <http://www.luc.edu/cas/advising/academicintegritystatement>. A basic mission of a university is to search for and to communicate the truth, as it is honestly perceived. A genuine learning community cannot exist unless this demanding standard is a fundamental tenet of the intellectual life of the community. Students of Loyola University Chicago are expected to know, to respect, and to practice this standard of personal honesty.

Any instance of dishonesty (including those detailed on the website provided above or in this syllabus) will be reported to the Chair of The Department of Chemistry & Biochemistry who will decide what the next steps may be. Dishonest behavior such as any form of cheating may cause to fail (grade = 0 or "F") an assignment, examination, or the course, depending the severity of the case. That grade assigned because of cheating cannot be "dropped".

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GRADING STANDARDS AND POLICIES:

Students enrolled will be evaluated based on the following:

1. in-class participation: percent average x 1.3, maxes out at 100 pts	100 pts	(10 %)
2. Homework (two lowest scores will be dropped): percent average x 1.5	150 pts	(15 %)
3. Quizzes (two lowest scores dropped): percent average x 2.5	250 pts	(25 %)
4. Midterms (lowest score dropped): percent average x 2.5	250 pts	(25 %)
5. Final exam: percent average x 2.5	250 pts	(25 %)
TOTAL ACHIEVABLE POINTS	1000 pts	(100%)

The following grading standards will be used (based on TOTAL points achieved, rounded to 0.1 %):

A 92.0 % and up	B + 84.0 % – 87.9 %	C + 72.0 % – 75.9 %	D + 60.0 % – 63.9 %
A – 88.0 % – 91.9 %	B 80.0 % – 83.9 %	C 68.0 % – 71.9 %	D 56.0 % – 59.9 %
	B – 76.0 % – 79.9 %	C – 64.0 % – 67.9 %	F 55.9 % and below

IN-CLASS PARTICIPATION

We will use TopHat for in-class instant polling. MOST polls have points awarded for participation (regardless whether or not you gave the correct answer), and SOME polls have additional points awarded for giving the correct answer. The instructor will not necessarily announce ahead of time whether points will be awarded for correct answers or not, so give every poll your full attention. There will be ample opportunity to earn polling points and they max out at 100 pts, so missing a few polls will not affect your score. Therefore, you will not be able to make up for missed polls even if your absence in class is excused (e.g. because of illness, sporting events etc.).

HOMEWORK

We will use the WileyPlus homework system. Homework deadlines are strict. If you miss a homework deadline for a legitimate reason, contact the instructor within 48 hours of the expired deadline. Deadline extensions are entirely at the discretion of the instructor.

QUIZZES

Approximately 11 quizzes (each lasting 10 – 15 mins) will be given at the beginning of lecture, tentatively scheduled for 1/26, 2/2, 2/9, 2/19, 2/23, 3/1, 3/18, 3/22, 4/5, 4/12, and 4/22. Quizzes missed for a legitimate reason can be made up for, and quizzes can be repeated the week following the quiz during office hours or before/after discussion sections. For quiz repeats, a point penalty will be applied.

MIDTERM AND FINAL EXAMS

There will be three midterm exams tentatively scheduled for 2/14, 3/13, and 4/17 during class. The University sets the schedule for all final exams. The final will be held on Thursday, May 2nd, 9 AM – 11 AM in the Flanner Hall Auditorium. You will have exactly 2 hours to complete the exam. Additional time will not be granted, even if you start late. There will be no make-up final exams given under any circumstance, and the exam will not be given early, either. Instructors may not reschedule final exams for a class for another day and/or time during the final exam period. There can be no divergence from the posted schedule of dates for final exams. Individual students who have four (4) final examinations scheduled for the same date may request to have one of those exams rescheduled. If a student reports having four final examinations scheduled for the same date, students should be directed to e-mail a petition to Adam Patricoski, Assistant Dean for Student Academic Affairs, CAS Dean's Office (apatricoski@luc.edu).

COPYRIGHT OWNERSHIP IN COURSE MATERIALS

My lectures and course materials, including presentations, tests, exams, outlines, and similar materials, are protected by copyright. I am the exclusive owner of copyright in those materials I create. I encourage you to take notes and make copies of course materials for your own educational use. However, you may not, nor may you knowingly allow others to reproduce or distribute lecture notes and course materials publicly without my expressed written consent. This includes providing materials to commercial course material suppliers such as CourseHero and other similar services.

ACADEMIC GRIEVANCES AND ACADEMIC APPEALS POLICIES

Students have the right to protection against arbitrary and capricious academic evaluations. Arbitrary and capricious means that there is no relation between the grade given and the student's performance in the class and that a reasonable person could not find that the grade was deserved. Mere disagreement or dissatisfaction with a grade does not constitute a basis for grievance. The procedure to resolve disputes can be found at: https://www.luc.edu/academics/catalog/undergrad/reg_academicgrievance.shtml.

Students also have the opportunity to request a review of circumstances that impact their academic standing or progress at the University. For example, you can appeal for a change in academic record, a finding of academic misconduct, a decision related to transfer credit, or a dismissal for poor scholarship. The procedure to request reviews can be found at <https://www.luc.edu/academics/catalog/undergrad/academicappeals>.

PHOTOGRAPHS, AUDIO OR VIDEO RECORDINGS

Any photographs taken of audio or video recordings of this course or materials of this course made by you are for the students' personal academic use only and may not be distributed in any manner (to any other individual or to the public) without written consent of the instructor (me).

In this class software may be used to record live class discussions. As a student in this class, your participation in live class discussions will be recorded. These recordings will be made available only to students enrolled in the class, to assist those who cannot attend the live session or to serve as a resource for those who would like to review content that was presented. All recordings will become unavailable to students in the class when the Sakai course is unpublished (i.e. shortly after the course ends, per the Sakai administrative schedule). Students who prefer to participate via audio only will be allowed to disable their video camera so only audio will be captured. Please discuss this option with your instructor.

The use of all video recordings will be in keeping with the University Privacy Statement shown below:

Privacy Statement

Assuring privacy among faculty and students engaged in online and face-to-face instructional activities helps promote open and robust conversations and mitigates concerns that comments made within the context of the class will be shared beyond the classroom. As such, recordings of instructional activities occurring in online or face-to-face classes may be used solely for internal class purposes by the faculty member and students registered for the course, and only during the period in which the course is offered. Students will be informed of such recordings by a statement in the syllabus for the course in which they will be recorded. Instructors who wish to make subsequent use of recordings that include student activity may do so only with informed written consent of the students involved or if all student activity is removed from the recording. Recordings including student activity that have been initiated by the instructor may be retained by the instructor only for individual use.

LOYOLA UNIVERSITY ABSENCE POLICY FOR STUDENTS IN CO-CURRICULAR ACTIVITIES (INCLUDING ROTC):

Students missing classes while representing Loyola University Chicago in an official capacity (e.g. intercollegiate athletics, debate team, model government organization) shall be allowed by the faculty member of record to make up any assignments and to receive notes or other written information distributed in the missed classes.

Students should discuss with faculty the potential consequences of missing lectures and the ways in which they can be remedied. Students must provide their instructors with proper documentation (develop standard form on web) describing the reason for and date of the absence. This documentation must be signed by an appropriate faculty or staff member, and it must be provided as far in advance of the absence as possible. It is the responsibility of the student to make up any assignments. If the student misses an examination, the instructor is required to give the student the opportunity to take the examination at another time.

ACCOMMODATIONS FOR RELIGIOUS REASONS

If you have observances of religious holidays that will cause you to miss class or otherwise effect your performance in the class you must alert the instructor within 10 calendar days of the first class meeting of the semester to request special accommodations, which will be handled on a case by case basis.

DISCLAIMER

THIS SYLLABUS MAY BE AMENDED AND/OR ALTERED AT ANY TIME DURING THE SEMESTER AT THE DISCRETION OF THE INSTRUCTOR.

TENTATIVE COURSE SCHEDULE

PLEASE NOTE THAT THE SCHEDULE IS APPROXIMATE WITH RESPECT TO COVERAGES; WE MAY GET BEHIND OR AHEAD AS THE SEMESTER PROGRESSES. YOU ARE RESPONSIBLE FOR EVERYTHING SAID IN LECTURE, EVEN IF YOU MISS CLASS.

WEEK	MON	WED	FRI
1	MLK Holiday no class	INTRODUCTION manipulating equations	(1) GASES ideal gas laws
2	(1) GASES kinetic theory, real gases	(1) GASES partial pressures	(2) KINETICS rate equations Q1
3	(2) KINETICS rate laws	(2) KINETICS first-order reactions	(2) KINETICS Arrhenius equation, catalysis Q2
4	(3) EQUILIBRIA reaction quotient, equ. constant	(3) EQUILIBRIA ICE tables	(3) EQUILIBRIA Le Chatelier's principle Q3
5	(4) ACIDS/BASES autoionization of water	MIDTERM 1	(4) ACIDS/BASES pH calculations
6	(5) AQUEOUS EQUILIBRIA Q4 relative strength of acids & bases	(5) AQUEOUS EQUILIBRIA Henderson-Hasselbalch equation	(5) AQUEOUS EQUILIBRIA Q5 buffer action
7	(5) AQUEOUS EQUILIBRIA titrations	(5) AQUEOUS EQUILIBRIA solubility products	(6) THERMODYNAMICS Q6 work, heat, enthalpy, free energy
8	SPRING BREAK		
9	(6) THERMODYNAMICS entropy	MIDTERM 2	(6) THERMODYNAMICS heat of formation
10	(6) THERMODYNAMICS Q7 bond dissociation energies	(6) THERMODYNAMICS free energy and equilibria	(7) LIQUIDS vapor pressure
11	(7) LIQUIDS heating curves, calorimetry	(8) SOLUTIONS Q8 thermodynamics of mixing	Easter Holiday no class
12	Easter Holiday no class	(8) SOLUTIONS vapor pressure of solutions	(8) SOLUTIONS Q9 colligative properties
13	(8) SOLUTIONS applications	(9) ELECTROCHEMISTRY redox reactions	(9) ELECTROCHEMISTRY Q10 relative strength of redox agents
14	(9) ELECTROCHEMISTRY voltaic cells	MIDTERM 3	(9) ELECTROCHEMISTRY Nernst equation
15	(10) SPECTROSCOPY UV/vis spectroscopy	(10) SPECTROSCOPY Q11 Jablonski diagram	(10) SPECTROSCOPY fluorescence spectroscopy
FINAL WEEK	FINAL EXAM: Thu, 5/2, 9 AM – 11 AM		