LOYOLA UNIVERSITY CHICAGO
DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

CHEM 260 – Quantitative Methods in Chemistry
SYLLABUS, SUMMER 2024

Instructor: Dr. Christophe RENAULT Office Hours: Mon 11:10 to 12:10 AM Location: Crown Center - Room 142	e-mail: crenault@luc.edu Course Website: 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.

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

COURSE FORMAT
Lecture: MoWeFri 8:20 AM – 11:15 AM, Crown Center, Room 142

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. They are held on Mondays at 11:15 AM in room 142 (Crown Center), right after the class.

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.

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.

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 to discuss their accommodations. All information will remain confidential. Please note that in this class, software may be used to audio record class lectures 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. A calculator.
2.Enrollment in WileyPlus for textbook (instructions will be given during the first class).
3. 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
Violations of Academic Integrity as a very serious offense against your fellow students and against the integrity of the university. 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. Use of Artificial Intelligence to generate a document is not allowed in this class. 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 SCHEME:
Students enrolled will be evaluated based on the following:

Mode of evaluation	% of final grade	
in-class participation	10	
homework	20 (the lowest score dropped)	
quizzes	25 (the lowest score dropped)	
Midterm	25 (the lowest score dropped)	
Final Exam	20	

GRADING SCALE
The following grading standards will be used (rounded to 0.1 %):

A	100 % – 92.0 %
A-	91.9 % – 88.0 %
B+	87.9 % – 84.0 %
B	83.9 % – 80.0 %
B-	79.9 % – 76.0 %
C+	75.9 % – 72.0 %
C	71.9 % – 68.0 %
C-	67.9 % – 64.0 %
D+	63.9 % – 60.0 %
D	59.9 % – 56.0 %
F	< 55.9 %

IN-CLASS PARTICIPATION
I will regularly ask questions in class. If no one spontaneously answers then, I will randomly designate persons in the room. I will ask questions to each person (at least three times) during the entire CHEM 260 class. You do not need to provide the correct answer to obtain participation points! I believe that incorrect answers are helpful to improve the performance of the entire group (better to have feedback before an exam than after). If you "do not know", it is okay. I will just expect you to explain what part of the question does not make sense so we can progress towards the answer.

HOMEWORK
I will provide homework through Sakai. Three homework will be given one week before the deadline. The deadlines are set at 8 AM on the 05/24, 06/05 and 06/14. 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. The lowest score will be dropped. This can account for a missing homework. They are to be returned as .docx file by email at crenault@luc.edu. The name of the file will be "Homework 1 –*first name*".

QUIZZES
Three quizzes (each lasting 10 – 15 mins) will be given at the beginning of lecture on the 5/24, 6/5 and 6/14. The lowest score is dropped. Absence will be taken care by dropping the lowest score. This will only work once! The quizzes will be graded during the class break, and you will be given an opportunity at the end of the same class to re-attempt the quiz. The objective it to provide you feedback while you are still motivated. You can demonstrate progress within a day!

MIDTERM AND FINAL EXAMS
There will be three midterm exams scheduled on 5/3, 6/10 and 6/21, respectively. The final will be held on June 28th. You will have exactly 1 hours and 2 hours to complete the midterm and final exams, respectively. Additional time will not be granted, even if you start late. There will be no make-up final exams given under any circumstance. The lowest score of the two midterms will be dropped. This will take care of absence for any reason. 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 can 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 od 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.

TENTATIVE COURSE SCHEDULE

Each topic has a different color. We will spend 2 class on each topic. Everything in bold is graded, prepare the test, return the homework.

WEEK	Monday	Wednesday	Friday
1	05/20 **GASES**: ideal gas laws, kinetic theory, real gases partial pressures	05/22 **GASES**: ideal gas laws, kinetic theory, real gases partial pressures	05/24 **Return Homework #1** **QUIZ over GASES** **KINETICS**: rate equations, rate laws
2	05/27 Memorial Day no class	05/29 **KINETICS** first-order reactions, Arrhenius equation, catalysis	05/31 **MIDTERM over GASES & KINETICS** **EQUILIBRIA**, reaction quotient, equilibria constants
3	06/03 **EQUILIBRIA**: ICE tables, Le Chatelier's principle	06/05 **Return Homework #2** **QUIZ over EQUI.** **ACIDS/BASES**: auto-ionization of water, pH calculations, relative strength	06/07 **ACIDS/BASES**: Henderson, buffer, titration solubility product
4	06/10 **MIDTERM over EQUI. & ACIDS/BASES** **THERMODYNAMICS**: work, heat, enthalpy, free energy	06/12 **THERMODYNAMICS**: entropy, heat of formation, bond dissociation, free energy equilibria	06/14 **Return Homework #3** **QUIZ over THERMO.** **SOLUTIONS**: heating curve, calorimetry, thermodynamics of mixing
5	06/17 **SOLUTIONS**: vapor pressure, colligative properties	06/19 Juneteenth no class	06/21 **MIDTERM over THERMO. & SOLUTIONS** **ELECTROCHEMISTRY**: redox reactions, relative strength of redox agents
6	06/24 **ELECTROCHEMISTRY**: Nernst equation, voltaic cells	06/26 PRACTICE for the EXAM	06/28 **FINAL EXAM**