



USC University of Southern California

Chem 105bL: General Chemistry (4.0 Units) Spring 2020

Lecture Time: MWF, 9-9:50am *OR* 11-11:50am

Location: SGM 123

Instructor: Dr. Jasmine Bryant

Office: SGM 450

Office Hours: MW 1-2:30pm, additional appointments may be requested by email

Contact Info: bryantja@usc.edu (preferred contact method)

Lab Instructor: Dr. Catherine Skibo

Office: SGM 138

Office Hours: MW 1:30-3pm

Contact Info: (213) 740-8265, skibo@usc.edu

Course Coordinator: Paperwork may be brought to the receptionist in SGM 401 or emailed as a PDF.

Electronic Office Hours: MW 1:30-3pm, emailed questions answered at this time

Contact Info: coord105@chemmail.usc.edu

Teaching assistant contact information and office hours times/location can be found on the course Blackboard site.

Course Description

The purpose of CHEM 105b is to introduce the basic chemical principles that underlie all of the molecular sciences (from materials and nanoscience to medicine and the machinery of biology). It will introduce good lab practice and how to make decisions based on sound data. Topics covered include reaction kinetics, equilibrium (including applications), acids and bases, entropy and thermodynamics, electrochemistry, and selected topics in inorganic and organic chemistry. After this course students will be both better prepared for continuing studies and have an understanding of molecular principles relevant to everyday life.

Prerequisite(s):

Chem 105A or Chem 107 or Chem 115A

Learning Objectives

Students who successfully complete CHEM 105b will be able to:

- Compare experimental conditions that influence reaction rates using rate laws, reaction mechanism, and collision theory.
- Connect forward and reverse reaction rates to describe a system at equilibrium.
- Determine the equilibrium constant for a chemical system and use it to qualitatively describe the relationship between amounts of reactants and products.

- Predict the equilibrium state of a chemical system in partial pressures or concentrations of reactants and products based on initial conditions.
- Predict the behavior of a chemical system at equilibrium when that system is perturbed by a change in conditions.
- Apply the First, Second, and Third Laws of Thermodynamics in relation to chemical systems by predicting the spontaneity of various processes.
- Describe the energetics of a chemical system using the state functions enthalpy, entropy, and free energy.
- Explain the equilibrium state of a chemical system using thermodynamic principles.
- Combine the kinetic and thermodynamic properties of a chemical system to explain whether a reaction will occur on an observable time scale.
- Explain electrochemical systems and the work produced in terms of thermodynamic principles.
- Use isomerism (structural, geometric, and stereo) to explain variation in chemical and physical properties.
- Apply bonding models to the structural study of organic molecules and transition metal coordination complexes.
- Use structural properties to classify the chemical nature of ions and molecules.
- Illustrate the concepts of kinetics, thermodynamics, and equilibria using reaction coordinate diagrams.
- Illustrate examples of the particulate level as related to the concepts above.
- Assess experimental data for accuracy and precision. Evaluate sources of error in laboratory measurements.

Required Materials

Chemistry: A Molecular Approach (5th edition) by Tro (package available in USC Bookstore includes for free the eText and Mastering Chemistry (MC not required); also available on Amazon).

Chem 105b Laboratory Manual (available for purchase in USC Bookstore)

Texas Instruments TI30XIIS calculator (available online and in the USC bookstore). **No other type of calculator allowed on exams.**

Laboratory equipment: Safety glasses, lab notebook, lab coat (100% cotton only) (all available in USC bookstore)

An internet-enabled device (smartphone, tablet, or computer) is required for every lecture.

Optional Materials

Solutions Manual for textbook

Calculations in Chemistry (2nd Edition) by Dahm (optional, recommended for students who desire additional practice with critical math and chemistry skills)

Description and Assessment of Assignments

Assignments in the course include exams, laboratory reports, video quizzes, in-class group quizzes, and in-class work (typically worksheets / case studies with clicker questions).

Grading Breakdown

There will be three one-hour exams and a final exam. Your grade will be determined according to the following distribution:

Assignment	Points	% of Grade
Exam 1	100	10%
Exam 2	100	10%
Exam 3	100	10%
Laboratory	290	29%
In-Class Work	90	9%
In-Class Group Quizzes	90	9%
Video Quizzes	30	3%
Final Exam	200	20%
TOTAL	1000	100%

To receive a passing grade, satisfactory work must be done in both lab and the lecture portions of the course. You are encouraged to check your grades on the Chem 105b website.

Grading Scale

Course final grades will be determined using the following scale:

Grade	Points	%
A	930-1000	93-100
A-	900-929	90-92.9
B+	870-899	87-89.9
B	830-869	83-86.9
B-	800-829	80-82.9
C+	770-799	77-79.9
C	730-769	73-76.9
C-	700-729	70-72.9
D+	670-699	67-69.9
D	630-669	63-66.9
D-	600-629	60-62.9
F	Below 600	Below 60%

Week 9 grade: We do our best to inform you on your progress in the course by assigning an approximate letter grade at the end of the ninth week. This is based on your performance in the course to date. Note: this advisory letter is no guarantee of your final grade. Final grades are assigned using the grading scale, above.

Course Notes

Lecture notes will be available on the course website after lecture. This course uses PollEverywhere for in-class work. An internet-enabled device is required for every class meeting.

Office Hours

You are strongly encouraged to see any TA during their office hours, not just your own. Office hours for all TAs are posted in SGM 149 (Chemistry Study Center) and on the class website. The Study Center is open Monday through Friday, 9 - 5.

Supplemental Instruction (SI)

The University has a Supplemental Instruction Program (<https://dornsife.usc.edu/chem105b/>) that we encourage you to use. The SI instructors hold weekly sessions going over the course material and problems. They also prepare mock exams, which you can use to test yourself before the midterms and finals. The SI leaders attend all of the lectures and are familiar with the lecture material.

Assignment Submission Policy

Laboratory reports are due at the beginning of your lab period one week after completing the lab exercise. Pre-lab exercises are due at the beginning of the relevant lab period.

Grading Timeline

Graded labs will be returned one week after they are submitted. Graded exams will be scanned and returned electronically within 48 hours of the exam with the exception of the final exam, which will not be returned. You can view your graded final exam during office hours.

Additional Policies

Exams

Exams: There will be three midterms and a final. No make-up exams will be given. *An unexcused missed hour exam will be counted as a zero towards your final grade.* The comprehensive final exam will be given on **Thursday, May 7, 8-10am**. This is the only time during which the final exam may be taken; there are no make-ups. Absences on the final exam do not automatically qualify for a grade of incomplete. ***If you cannot take the final during this***

designated time, you should not take this course. All electronic devices such as cell phones and smart watches are prohibited and cannot be used for any purpose during the exam, including keeping time. No one will be allowed to enter the exam room late or to leave early. Graded exams will be scanned and available for viewing/printing from gradescope.com (more information available on the course website). If you find an error in the grading of your exam, you may submit a regrade request. The regrade deadline is 5pm on Monday following each midterm exam and 12 noon on Monday following the final exam. To request a regrade for an exam, compare your answers carefully with the posted key and then submit your request through gradescope.com. NOTE: A regrade request is a request to have your entire exam graded more carefully. Your entire exam will be regraded and **your score may go down**.

Exam Absences: Make-up exams will not be given under any circumstances. Absences will be excused based on official University policy (verifiable illness or necessity). An excused absence from an exam will be granted only on the basis of proper documentation such as a note provided by a physician or hospital. **For illness/emergency, telephone the Course Coordinator 213-740-7036 on the morning of the absence (or prior).** In the case of non-illness necessity, email the Course Coordinator (see page 1) about the written verification prior to the absence. All excuses will be verified. Students with an excused absence on a midterm exam are assigned a score based on their final exam (an equivalent portion of the standard deviation from the average). Only one exam can be excused. All unexcused absences will result in a score of zero for that exam. **Students must take at least two of the three midterms AND the final.**

Laboratory

Laboratory Orientation: The mandatory lab orientation lecture will be given during the quiz period on Thursday Jan 16 in SGM 123. You must attend the lab orientation in order to maintain your space in the lab and thus to remain in the course. Attendance at this lecture and at the first scheduled lab meeting is mandatory for all registered students. If you cannot attend both at your assigned times, you won't be permitted to continue in the laboratory portion of the course.

Safety glasses and a lab coat (100% cotton) are required for every person in the lab at all times. All persons in the lab are required to wear long pants, shirt with sleeves, socks and covered/closed-toe shoes. Lab begins with Check-in & Experiment 1 at your scheduled lab time the week of Jan 27.

Quiz Period/Lab Lecture: There will be 30-minute lab lectures given during the quiz period in SGM 123 at 3:30 each Thursday that the quiz period is not used for assessment test, exams or lab orientation. A schedule of the lab lecture topics will be posted on the Chem 105b Laboratory page on Blackboard.

Lab Scores: See Blackboard for lab scores (reports, prelab quizzes, etc.) and informational material.

Lab Exam: At the end of the semester there will be one 60-minute cumulative lab exam and one 60-minute lab practical. The written lab exam will be held during the Thurs Apr 30 quiz period in your assigned exam room (same as for midterm exams). Questions typically cover the procedure, safety issues, relevant chemical formulas and chemical equations, observations, calculations, and data analysis (bring a calculator). The lab practical will be held during your scheduled lab section (Apr 27-May 1).

Laboratory Attendance: *This is a laboratory course and attendance to all lab periods is mandatory. No make-up labs can be given in this course.* Absences will be excused only for medical reasons or in the case of extreme necessity. For lab absences, email Dr. Skibo (skibo@usc.edu) as soon as possible in order to arrange a make-up lab or a make-up lab exam. You must arrive on time and prepared for lab. If you show up more than 10 minutes late, you will not be admitted to lab. Before leaving lab, you must have your notebook checked and signed by the TA or

you will receive a zero for the lab. Satisfactory completion of all labs and lab work is required to pass the class. Additional laboratory policies can be found in the lab syllabus.

Late work: Unless otherwise directed by Dr. Skibo, all lab reports are due at the beginning of the following week's lab. The lab calendar on the 105b lab page shows due dates for all assignments. ALL assignments must be submitted by May 1. Assignments received more than 9 days late will receive a maximum score of up to 5 points for the pre-lab assignment. The rest of the report will be evaluated as Pass or No Pass. Post-lab assignments will be submitted through the Chem 105b Lab Blackboard page. Please review your TA's feedback promptly. Regrades on laboratory reports must be requested within one week of when the lab report is graded.

Lecture

Lecture Attendance: The lecture period will be used to teach concepts and work in groups or individually to solve problems. In-class work will be assigned and collected that day. There are no make-ups for points lost due to absences for any reason, but 10% of the in-class work points will be dropped at the end of the semester to account for unexpected absences or other issues. In-Class poll questions are graded on participation alone. In-class Group Quiz questions will be assigned in lecture each day. These clicker questions are counted separately from the In-Class Work poll questions and amount to 9% of your total class grade. There are no make-ups for these points if you are absent. In-Class Quiz questions are graded based on the accuracy of your answer. Group work is allowed (and encouraged) for all In-Class questions (poll and quiz)

Homework

Video Quizzes: Prior to each lecture you will be asked to watch a short video and complete a related quiz on Blackboard. There are a total of 30 videos throughout the semester. You will earn 1 point for answering each question correctly. Your top 30 scores will count toward your final grade. You will not earn points for submitting answers after the deadline. Each quiz is due by 9am. Please carefully note all due dates and times (found in Blackboard). There are no make-ups and no late submissions.

Homework: It is recommended that students spend 6-9 hours per week outside of class on Chem 105b-related work. Recommended end-of-chapter problems and additional practice problems will be posted on the course website. These items will not be graded, but students are expected to do them. Answers can be checked with posted answer keys, in the solutions manual, and in TA and instructor office hours.

Classroom norms

Listen actively and attentively.

Be courteous. Don't interrupt or engage in private conversations while others are speaking.

Ask for clarification if you are confused.

Course evaluation

Students will submit confidential course evaluations, available online during week 15. More information will be provided in lecture.

Course Schedule: A Weekly Breakdown (Tentative – changes will be announced in lecture or on Blackboard)

	Topics	Readings	Assignments
Week 1 Jan 13 - 17	M: Course Intro W: Reaction Rates & Rate Laws F: Order & Half-Life	15.2-15.3 15.4, 21.6	Th: Mandatory Lab Orientation: SGM 123
Week 2 Jan 20 - 24	M: HOLIDAY W: "Pseudo" Order Reactions F: RCDs & Activation Energy	15.5	No lab this week Optional lab boot camp T/W
Week 3 Jan 27 - 31	M: Mechanisms & Catalysis W: Equilibrium Expressions F: ICE Tables	15.6-15.7 16.2-16.4 16.5-16.8	Lab: Lab #1 - Kinetics (Mandatory Check-In) F: Last day to drop without a "W" and avoid a tuition charge.
Week 4 Feb 3 - 7	M: Le Chatelier's Principle W: Equilibrium Wrap-Up F: Acids & Bases	16.9 17.2-17.4	Lab: Lab #2 – Rate Laws
Week 5 Feb 10 - 14	M: Weak & Strong Acids W: pH & pOH / Review F: pH of Solutions	17.4-17.6 17.6-17.7 17.8-17.9	Lab: Lab #3 - Equilibrium Th: Feb 13: Exam #1
Week 6 Feb 17 - 21	M: HOLIDAY W: Intro to Buffers F: pH of Buffer Solutions	18.2-18.3 18.4	No lab this week
Week 7 Feb 24 - 28	M: Titrations W: Solubility Equilibrium (ONLINE) F: Entropy, Microstates	18.4 18.5-18.6 19.2-19.3	Lab: Lab #4 - Buffers F: Last day to drop without a "W"
Week 8 Mar 2 - 6	M: Spontaneity W: Gibbs Free Energy F: Non-Standard Conditions	9.4-19.5 19.6-19.8 19.8-10.10	Lab: Lab #5 – Potentiometric Titrations
Week 9 Mar 9 - 13	M: Redox Review W: Review F: Galvanic Cells	20.2 20.3-20.4	Lab: Lab #6 – Solubility Equilibrium Th: Mar 12: Exam #2
Mar 16-20	S P R I N G B R E A K		
Week 10 Mar 23 - 27	M: Nernst Equation W: Concentration Cells F: Electrolytic Cells	20.5 20.6 20.8-20.9	Lab: Lab #7 - Electrochemistry
Week 11 Mar 30 – Apr 3	M: Transition Metals W: Coordination Chemistry F: Isomers	26.2 17.11, 18.8, 26.3 26.4	Lab: Lab #8 - Corrosion F: Last day to drop with a "W"
Week 12 Apr 6 - 10	M: Optical Isomers W: Crystal Field Theory F: Spectrochemical Series	26.5-26.6	Lab: Lab #9 – Transition Metals (Mandatory Check-Out)
Week 13 Apr 13 - 17	M: Intro. to Hydrocarbons W: Naming & Functional Groups F: Spectroscopy & Functional Groups	22.2-22.4 22.5-22.8 22.9-22.11	Lab: Lab #10 – Organic, Pt. 1 Th: Apr 16: Exam #3
Week 14 Apr 20 - 24	M: Spectroscopy W: Organic Reactions F: Organic Reactions	17.10	Lab: Lab #11 – Organic, Pt. 2
Week 15 Apr 27 – May 1	M: Organic Techniques W: Wrap-Up F: Review		Lab: Lab Practical Exam Th: Written Lab Exam
FINAL EXAM: THURSDAY, MAY 7, 8-10am			

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention and Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED)- (213) 740-5086 | Title IX – (213) 821-8298
equity.usc.edu, titleix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following *protected characteristics*: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations. The university also prohibits sexual assault, non-consensual sexual contact, sexual misconduct, intimate partner violence, stalking, malicious dissuasion, retaliation, and violation of interim measures.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710

uscsa.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.