Chem 105bL: General Chemistry Discovery Section (4.0 Units)
Spring 2021 - preliminary

Lecture Time: MWF, 10-10:50am
Location: ONLINE
Instructor: Dr. Jessica Parr
Office: SGM 445
Office Hours: W 1-2 pm (online), additional appointments may be requested by email
Contact Info: parr@usc.edu (preferred contact method)

Lab Director: Dr. Catherine Skibo
Office: SGM 138
Office Hours: MW 1:30-3pm (online)
Contact Info: (213) 740-8265, skibo@usc.edu

Course Coordinator: Paperwork should be 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 or equivalent

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: Discovery Section Laboratory Manual (available for purchase in USC Bookstore).
An internet-enabled device (smartphone, tablet, or computer) is required for every lecture and laboratory.

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 quizzes, homework assignments, writing assignments, laboratory reports, video quizzes, and in-class work (typically worksheets / case studies with clicker questions).

Grading Breakdown

Your grade will be determined according to the following distribution:

Assignment	Points	% of Grade
Weekly Quizzes	240	24%
Group Data Analysis Assignments	150	15%
Homework	120	12%
Weekly Write-Ups	120	12%
In-Class Participation	60	6%
Lab Reports	150	15%
Video Quizzes	30	3%
Weekly Summaries	55	5.5%
Final Project	75	7.5%
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 Blackboard.

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 8 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 eighth week. This is based on your performance in the course to date. Note: this advisory letter grade is no guarantee of your final grade. Final grades are assigned using the grading scale, above.

Course Notes

Keys for lecture/lab activities will be posted on the course Blackboard site for you to review.

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 on Blackboard.

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

Homework and Individual Write-Up assignments will be submitted through Blackboard. Homework assignments are opened on Wednesdays and will be due at 10 am the following Wednesday. Individual Write-Up assignments are opened on Fridays and will be due at 10 am the following Friday. Information on the Laboratory Reports, Data Analysis Assignments, and the Final Project will be provided as needed.

Additional Policies

Laboratory

Laboratory Orientation: The mandatory lab orientation will take place during the first quiz period Thursday 1/21.

Laboratory Attendance: *This is a laboratory course and attendance to all lab periods is mandatory.* Absences will be excused only for medical reasons or in the case of extreme necessity. For lab absences, email Dr. Parr (parr@usc.edu) as soon as possible in order to arrange a make-up lab. 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. Satisfactory completion of all labs and assignments is required to pass the class.

Homework and Graded In Class Assignments

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 34 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 10 am of the relevant lecture. Please carefully note all due dates and times (found in Blackboard). There are no make-ups and no late submissions.

Homework: There will be a homework assignment posted on Blackboard on Wednesdays. The homework assignments are to be completed and submitted through Blackboard by 1 pm the following Wednesday. Homework assignments will be graded. There will be a total of 14 homework assignments throughout the semester, your top 12 scores will count toward your grade at the end of the semester.

Weekly Write-Up: There will be short written assignments posted on Blackboard on Fridays. The written assignments are to be completed and submitted through Blackboard by 1 pm the following Friday. Written assignments will be graded. There will be a total of 14 assignments throughout the semester, your top 12 scores will count toward your grade at the end of the semester.

Lab Reports: There will be reports assigned for ten of the laboratories throughout this semester. In these reports, you will present the data that was collected and discuss the results.

In-Class Participation: During each lecture there will be clicker questions that you will use Poll Everywhere to answer and Google docs that you will work with fellow classmates with in breakout groups. If you are not able to attend the synchronous zoom session, there will be an asynchronous assignment that will be completed for class participation credit.

Weekly Summaries: Each week you will be asked to complete a short form summary of what we worked on for the week. You will be asked what the most important thing you learned for the week, what questions you have remaining, and how you saw chemistry in action this week. Each of these summaries will be worth 4 points and will be due Monday at 10 am the following week.

Group Data Analysis Assignments: Five times throughout the semester you will work in a group with three other students to complete a Data Analysis Assignment. These assignments will be worth 30 points each and will take place during the synchronous session. They can be found in the schedule below.

Final Project: At the end of the semester you will complete a short final project, more details will be provided separately.

Weekly Quizzes: Each week there will be a quiz on Thursdays. The quiz will open at 8 am on Thursday and close at 10 pm on the same Thursday. Once the quiz is opened, you will have 30 minutes to complete the quiz. Each quiz will have 5 to 7 questions and be worth 20 points. The top 12 quiz scores will count toward the total at the end of the semester.

Late Work: Late lab reports, homework, writing assignments will be assigned the following penalties: -1 point up to one week late, -2 between one and two weeks late, -3 between two and three weeks late, etc. Late video quizzes will lose half of the credit earned. Weekly quizzes cannot be taken or submitted late.

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 13. More information will be provided in lecture.

Lecture and Lab Schedule

Week	Date	Topic
0	1/15	Syllabus and Course Structure
1	1/18	**No Classes –** Martin Luther King's Birthday
	1/18 – 1/20	**No Labs this Week**
	1/20	Introduction to Chemical Kinetics
	1/21	*Lab Orientation – During Quiz Period*
	1/22	Method of Initial Rates
2	1/25	Integrated Rate Equation
	1/25 – 1/27	Lab - Method of Initial Rate
	1/27	Collision Theory and the Arrhenius Relationship
	1/29	Reaction Mechanisms
3	2/1	Group Data Analysis Assignment I
	2/1 – 2/3	Lab – Integrated Rate Law
	2/3	Introduction to Chemical Equilibrium
	2/5	Chemical Equilibrium Calculations I
4	2/8	Chemical Equilibrium Calculations II
	2/8 – 2/10	Lab – Le Châtelier's Principle
	2/10	Solubility and Precipitation I
	2/12	Solubility and Precipitation II
5	2/15	No Classes – President's Day
	2/15 – 2/17	Lab –
	2/17	Acid/Base Definitions
	2/19	Acid/Base Calculations I
6	2/22	Acid/Base Properties of Salts
	2/22 – 2/24	Lab – Acid/Base Properties of Salts
	2/24	Structure Effects and Amphoteric Species
	2/26	Group Data Analysis Assignment II
7	3/1	Buffers I
	3/1 – 3/3	Lab –
	3/3	Buffers II
	3/5	Buffers Practice
8	3/8	Group Data Analysis Assignment III
	3/8 – 3/10	Lab – Acid/Base Titrations
	3/10	Introduction to Entropy
	3/12	*Wellness Day – No Class*
9	3/15	Free Energy and Spontaneity and Standard Free Energy Changes
	3/15 – 3/17	Lab –
	3/17	Free Energy and Non-Standard Conditions
	3/19	Temperature Dependence of an Equilibrium Constant

10	3/22	Oxidation-Reduction Reactions
	3/22 – 3/24	Lab – No Labs
	3/24	Galvanic Cells
	3/26	Reduction Potentials
11	3/29	Nernst Equation – Cell Potential at Non-Standard Conditions
	3/29 – 3/31	Lab – Temperature Dependence of an Equilibrium Constant
	3/31	Concentration Cells and Electrolysis
	4/2	Group Data Analysis Assignment IV
12	4/5	Coordination Compounds – Nomenclature
	4/5 – 4/7	Lab – No Labs
	4/7	*Wellness Day – No Class*
	4/9	Coordination Compounds – Isomers I
13	4/12	Coordination Compounds – Isomers II
	4/12 – 4/14	Lab –
	4/14	Precipitation and Complex Ion Equilibrium
	4/16	Crystal Field Theory
14	4/19	Nomenclature of Hydrocarbons II
	4/19 – 4/21	Lab – Crystal Field Theory
	4/21	Nomenclature of Hydrocarbons I
	4/23	Functional Groups
15	4/26	Structure and Isomers and Organic Reactions
	4/26 – 4/28	Lab – Infrared Spectroscopy
	4/28	Group Data Analysis Assignment V
	4/30	*Wellness Day – No Class*

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.

Campus Support & Intervention - (213) 821-4710
campussupport.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.