

Chemistry 1221 – Honors General Chemistry II – Spring 2020

COURSE DESCRIPTION

Chemistry 1221 is a four-credit course that consists of three lectures and two discussions per week. Chemistry 1241 is the companion one-credit lab course. CHEM 1221/1241 are general chemistry courses that are comparable to any science majors' sequence taught at major state universities in the United States. As a student, you are expected to perform at a level that is commensurate with students from other elite institutions across the country. We expect excellence from you as well as from ourselves! In addition to many crucial and fundamental chemical principles, we will integrate research activities into our lectures. In our endeavors as humans, scientists and thinkers, if our practices are not sustainable over the long-term, are we not "doomed"?

Instructor: Dr. Luisa Whittaker-Brooks, HEB-N 1320A, luisa.whittaker@utah.edu
Dr. Sushma Saraf, Lab Instructor, s.saraf@utah.edu
Eric Campbell, eric.campbell@utah.edu

Office Hours: Wednesday & Friday, 11:00 AM – 12:00 PM
Secretary: Dasha Walker, HEB 1340, 801-581-5681, dasha.walker@utah.edu
Lecture: Monday - Friday, 8:35 – 9:25 AM, ST 205
Discussion Sessions: as per schedule, 8:35 – 9:25 AM, ST 205

EXAMS: The dates of the three (3) midterm exams are noted on the course schedule.

FINAL: April 23, 2020 (8:00 – 10:00 am) Room: TBA

No Early, Late, or Make-up Exams or "Extra Credit."

Textbook: Chemistry, Structure and Properties, Nivaldo J. Tro
Recommended: ACS Study Guide for General Chemistry Final Exam.

- Be sure to activate the Canvas Page for this course and read all announcements published on that page.
- This is an Honors version of the second semester class in General Chemistry for Science Majors. The laboratory course CHEM 1241 is a co-requisite.
- The greatest stumbling block in CHEM 1221 is the inability to go from a word problem through an algebraic expression to a solution. You should not take CHEM 1221 unless you have already taken, or are currently taking, a course in algebra (i.e. Math 1050 or equivalent) through the concept of logarithms.
- We will cover Chapters 15-23 of the book. I will assume that you *already know* the names and symbols of the first 36 elements (but don't stop there), the names, formulas and charges for common cations & anions, common polyatomic ions and can identify the diatomic elements (N₂, O₂, F₂, Cl₂, Br₂, I₂). If this is not the case, please memorize this information now. You should learn the meaning and application of the SI Prefixes (M, η). You will need a scientific calculator capable of log/exponential functions and scientific notation for this course. You may NOT use a more sophisticated device capable of storing alphanumeric data or special equation solving capability. These same rules are enforced in other general chemistry courses. Buy (~\$10) or otherwise obtain an appropriate calculator now and learn how to use it! It is wise to read the assigned chapter prior to attending class. Some class time will be devoted to problem solving in both lecture and discussion sections and we will have occasional guests who will present special topics relevant to the chemical science.
- The laboratory and lecture segments of CHEM 1221 are intimately related, and concepts learned in lecture will be put to the use in the laboratory (or viceversa).

The Final Grade in this course will be based on total points earned:

Three 1221 in-class exams (50 Points Each)	Total Possible = 150
Homework/in-class Assignments (6)	Total Possible = 120
Discussion section Assignments (3)	Total Possible = 60
Pop-up attendant quizzes (3)	Total Possible = 30
Learning success resources (3)	Total Possible = 30
Special assignment	Total Possible = 100
Final ACS Exam	Total Possible = 170
	Grand Total = 660

Final grades will be assigned on the following basis:

A	≥ 93.00%	B+	89.99 – 87.00%	C+	79.99 – 77.00%		
A-	92.99 – 90.00%	B	86.99 – 83.00%	C	76.99 – 73.00%	D	69.99 – 60.00%
		B-	82.99 – 80.00%	C-	72.99 – 70.00%	E	≤59.99% (≤ 359.9)

The final ACS exam will also be used to replace any missed exam. Your lowest score in-class exam will also be replaced with the ACS exam (if you do better in the ACS exam).

Final grades are not posted to Canvas nor will the instructor provide you with that information. All students can access their grades via the PeopleSoft system once they are posted and released by the Registrar's Office.

Any requests for re-grades must be turned into Professor Whittaker-Brooks the same week the exam is returned; TAs are great sources of advice but cannot award additional points on exams.

(1) Please consult with the Center for Disability Services, Room 162, Olpin Union (801-581-5020) to arrange for any special accommodations required to meet the expectations of this course.

(2) All students will be subject to the University of Utah Student Code. (<http://www.sa.utah.edu/code/>)

COURSE OBJECTIVES

When you successfully complete this course, you will be able to:

- Determine Reaction rates and determine reaction mechanisms
- Apply Le Chatelier's Principle to solve equilibrium problems
- Calculate pH values of strong and weak acid solutions
- Determine the effect of structure on acid-base properties
- Prepare buffer solutions as well as perform simple titration experiments
- Perform precipitation and qualitative analysis experiments
- Balance oxidation-reduction equations
- Understand various basic concepts underlying the working principles of energy storage devices
- Understand the basic physical and chemical properties of representative elements and transition metals
- Understand the basic physical and chemical properties of organic and biological molecules

ASSIGNMENTS

- The following Chapters will be covered in CHEM 1221
 - Chapter 14 – Chemical Kinetics
 - Chapter 15 – Chemical Equilibrium
 - Chapter 16 – Acids and Bases
 - Chapter 17 – Aqueous Ionic Equilibrium
 - Chapter 18 – Spontaneity, Entropy, and Free Energy
 - Chapter 19 – Electrochemistry
 - Chapter 22 – Transition Metals and Coordination Chemistry
 - Chapter 21 – Organic and Biological Molecules

It is a good idea to *work numerous problems* in the back of the chapters, which will improve your familiarity with the material.

ATTENDANCE

- Attendance is mandatory in CHEM 1221. It is strongly recommended that you attend class since students who show up for lectures do better in the class.
- You should schedule all activities such as advising appointments, preregistration, Regents Examinations, etc. early in the semester so that they do not interfere with regularly scheduled assignments or labs. Such absences are not excused.
- Assignments or labs missed because of participation in officially scheduled University of Utah functions will be considered as excused absences. Typically this means that we will average your other scores for the missed assignment and substitute the average score. A written statement by the sponsoring University of Utah faculty member, on University Department letterhead, must be submitted to your instructor one week prior to the function to receive an excused absence. This does not include club sports sponsored by Associated Students of the University of Utah.
- **You are responsible for announcements made in class. Absence from class does not relieve you of this responsibility.**

Discussion Sessions:

CHEM 1221 students must participate in the Discussion Section (as per schedule, 8:35-9:25 AM, ST 205)

- Learning to solve problems and build accurate mental models in general chemistry is the focus of the discussions, which are led by teaching assistants (TA's). Discussions are not meant to be repetitions of the class lectures, and in some cases will present material that your lecturer does not cover in class. Your TA's primary job is to help you solve chemical problems. The problems solved during discussion sections are designed to help you improve your problem solving skills. Assignments will be given during the discussion sessions.

Tutoring Room

- The Chemistry Department has a tutoring area in room HEB 1316 of the Chemistry Building. It is open and available to you from 8:00 AM to 6:00 PM on Monday to Friday. Each general chemistry TA is required to spend at least 2 hours per week there. We will post a schedule for you in the room as soon as the times are assigned. You may attend any of our TA office hour sessions.
- This is the perfect time and place for you to get one-on-one tutoring from one of our TA's. Please take advantage of this opportunity.

Homework/in-class Assignments

- Completing these assignments is an important part of ensuring your success in the course. Experience with prior classes shows that if you score at least 80% on your homework assignments you will have a very high probability of passing the course.
- Homeworks will be assigned by Prof. Whittaker-Brooks.
- **Late homework submissions will not be counted given that the turnaround for grading is pretty fast.**

Exams

- The material covered on each examination will include everything in the assigned chapters except material that is explicitly excluded. An announcement of the point at which each exam will "stop" will be made in class and posted on the Canvas site the week before each exam.
- To be fair to all, questions about what will be covered on exams will be answered in class only. No such questions will be answered by telephone or e-mail.
- Subject matter covered on each exam will include everything in the previously assigned chapters, except material that is explicitly excluded, and a "study sheet" for each exam will be listed on the course Canvas page.
- The only legitimate excuses for missing your testing period are extenuating circumstances that are beyond your control. Examples of these circumstances are illness, death in the family, or car accidents on the way to take the test. Forgetting when to come take your exam or sleeping through your exam period are not legitimate excuses. Excuses must be accompanied with proper documentation. **Students that miss an exam due to illness must bring documentation from a physician stating that they were seen in the physician's office and that they were too ill to attend classes on that date.** Legitimate excuses must be documented within two days of the missed exam period. If you miss your exam period because of extenuating circumstances, it is your responsibility to inform your instructor in a timely fashion. Your instructor will then discuss with you appropriate measures to remedy the situation.
- Students who arrive late for the exam will be allowed to begin the exam at the time they arrive but will lose all of the time they are late on the exam.

- Exam scores are typically posted on the Canvas grade book within four school days of the last exam day. A message will be posted on the Canvas Discussion area letting everyone know when grades are posted.
- Any questions regarding credit on an exam question must be submitted in writing within two days after the grades have been posted on Canvas. Any questions regarding exam credit will not be considered after two days.
- In-class Midterm Exams will be given on the following dates:
 - Midterm Exam 1 Thursday, February 6th**
 - Midterm Exam 2 Thursday, March 5th**
 - Midterm Exam 3 Thursday, April 16th**

SPECIAL ASSIGNMENT

Designing an experiment and carrying out the plan are what scientists do. Developing the ability to design an experiment is critical to understanding of the scientific process and in promoting critical thinking skills. This skill can be developed if students are allowed to work like scientists. In order to be successful in designing an experiment, understanding it is necessary. After developing basic understanding of the scientific methods, the next process is designing steps in performing investigation. Here are some of the sample problems that can be explored:

- (1) How do we investigate the properties of nylon? Explain the reason for the development of this polymer.
- (2) How do we construct a mobile of organic molecules that illustrates molecular symmetry?
- (3) How do we test several foods for the presence of protein?

Things to consider

As a team of 3 students, address the following scientific processes when designing an experiment:

- Develop your own problems dealing with any subfield of chemistry (organic, inorganic, analytical, materials, physical, biochemistry) - What do you want to find out?
- Formulate your hypothesis to be tested-Based on previous knowledge and information, what educated guess do you want to test?
- Design a procedure and list the materials needed- What procedure should be followed to test your hypothesis? What measurements and observations are necessary to determine whether your hypothesis is correct?
- Suggest proposed measurements, observations or a model.
- Predict data collection and analysis - Review the recorded data, such as observations or measurements to determine what happened during the experiment. Compare the observations between the control and the experiment.
- What conclusions could be drawn with respect to the hypothesis -Determine whether the data that will be collected by the observations and measurement supports the hypothesis. Review the steps in organizing an experiment by arranging the events in a chain concept map. Work in-groups to develop and set up each of the steps involved.

Written report (minum three pages): should follow the same format of the lab report documents provided in Chem 1241.

Provide: pre-lab assignment, objectives, introduction with references, experimental procedure, questions to be assessed.

Oral report: 10 minute powerpoint presentation should be put together and presented to Prof. Luisa Whittaker-Brooks in an assigned time slot. The presentation should include background, significance, hypothesis and how this will be tested, and questions to answer and they will be answered. **Presentations are due the week of April 20 -25, 2020. Group of up to 3 students per assignment.**

The written report is worth 70 pts. The oral presentation is worth 30 pts.

WITHDRAWAL INSTRUCTIONS

- Subject to changes in the official University of Utah Calendar, students may drop (delete) any class without penalty during the first week of the term. The last day to drop a class without tuition penalties is **January 17, 2020**. It is possible to withdraw from the course up to **March 6, 2020**, but you will still have to pay tuition for the course and a "W" will appear on your transcript. You do NOT need the instructor's signature to withdraw. After March 2nd, a student must petition for withdrawal to the Dean's office of their academic college. University policy states that withdrawals after this date should only be granted for "non-academic reasons beyond the student's control." "I want to avoid a bad grade" or similar does not qualify. Students must decide on or before **March 6, 2020** if they wish to withdraw from CHEM 1221.

- With respect to the course content, it is the student's obligation to determine, before the last day to drop courses without penalty, when course requirements conflict with the student's sincerely-held core beliefs. If there is such a conflict, the student should consider dropping the class. A student who finds this solution impracticable may request a content accommodation from the instructor. Though the University provides, through this policy, a process by which a student may make such a request, the policy does not oblige the instructor to grant the request, except in those cases when a denial would be arbitrary and capricious or illegal. This request must be made to the instructor in writing, and the student must deliver a copy of the request to the office of the department Chair or to the office of the Dean of the College of Science. The student's request must articulate the burden the requirement would place on the student's beliefs.

ACS FINAL EXAM

- The Final Exam is April 23, 2020

- The only students who will be allowed to take the final exam at an alternate time, are those with an exam conflict or three (3) exams in a single day. No other exceptions will be made. Students with exam conflicts or three (3) exams on the same day must look at this website [Final Exam Schedule Conflicts](#) and click on "Final Exam Schedule Conflicts". The procedure for documenting this problem is outlined on the website.
- The Final Exam will be multiple choice, but will be done on paper with a number 2 pencil.
- The key for the Final Exam will not be posted because we are not allowed to post keys for ACS Exams.
- Final Exam scores are not posted to Canvas.
- This ACS final exam is comprised of 70 questions and is given in a 120-minute time frame.

Semester Start and End Dates

- Spring Semester 2020 begins on Monday, January 6th and ends on the final exam date. Requests to miss the final exam, take it early, etc. because of vacation or other personal plans will be denied.

This course meets the Science Foundation General Education Requirement (SF)

This course is inherently useful to students since it provides them with tools to understand the world around them with a focus on matter and energy. Key topics include: Measurement and Uncertainty, Atomic Structure, Atoms and Molecules, Bonding, Molecular Structure, Energy, Gases, Liquids, Solids, Stoichiometry and Chemical Reactions.

Students develop strong problem solving skills in this class and develop models of structure and bonding to explain the world from a chemical perspective. Students use the scientific method to propose and test theories that describe the workings of the material world.

A knowledge of chemistry is essential to understanding the great challenges facing the world in areas as diverse as energy, health care and the environment, to name a few. Discussion of these topics as examples of "applied" chemistry naturally arise in the classroom, from the text and on the web. More broadly, the course employs the scientific method as a means of acquiring and assessing knowledge and thus contributes to the critical thinking skills of our students. Guest lectures also provide insight into topics such as Drug Design, Radioactivity, Energy and the Environment and modern instrumentation.

The small class size (approximately 30-50 students compared to 350 in a lecture setting in the main line course) make for an informal and interactive "lecture" environment. Team problems solving sessions are held weekly.

All of the students enrolled in CHEM 1221 enroll in a special laboratory course CHEM 1241 (1-credit hour, approximately 20 students per section) led by a teaching assistant. The small size allows for more labs with a "special projects" flavor that emphasize the discovery aspects of science.

Integrative thinking is required for successful problem solving in chemistry where math, matter and logic are all needed to solve quantitative problems.

The problem solving focus that is in the DNA of this course requires critical thinking and strong reasoning skills. Student must develop the skills to analyze a problem, select what quantitative and/or qualitative tools to solve the problem determine what facts, formulas and data are needed to reach a solution.

This course will provide opportunities to develop the following Learning Outcomes:

Problem Solving: This will be assessed by student performance on midterm and final exams, team problem sets in discussion sections, and electronic homework problem sets.

The problem solving inherent in this General Chemistry course gives students numerous opportunities for acquiring skills in Critical Thinking/Reasoning.

This course will provide students with Foundations and Skills for Lifelong Learning since the problem solving skills developed in this course can be applied to real world problems. Many of the issues facing our society, including energy and the environment, can be constructively approached from a chemical perspective.

You have all chosen to be here for various academic and professional reasons.

My promise to you is that this will be a stimulating and challenging course and your hard work will pay off in enhanced problem solving ability and increased understanding of the world around you from a chemical perspective.

I hope you will enjoy your study of chemistry. I am not claiming to be perfect, thus if you have any suggestions that will make the class more enjoyable, do not hesitate to voice them. You are the most important component of this course!.

University Policies

1. The Americans with Disabilities Act. The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

2. University Safety Statement. The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu

3. Addressing Sexual Misconduct. Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).