

Principles of Chemistry, Chemistry 1220, Summer online section 2021
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Office Hours:	On line office hours can be made by appointment by emailing me. On line office hours will be administered through Zoom. The link to the zoom meeting room will be: https://usu-edu.zoom.us/j/8567161245?pwd=SUtOc0xkbDhuV0MydHl1UEhIRG0xZz09 If prompted for a password, enter tadpoles
Text: (optional)	On-line reference text: https://openstax.org/details/books/chemistry-2e We will cover chapters 12-21 of this open source (free) online textbook. If you would like a physical reference text, I recommend " <i>Chemistry: The Central Science</i> " Brown, Lemay & Bursten, any older edition (8 th - 14 th ed.) These older editions can be bought for a fraction of the cost of the current edition (typical cost will be 5-10 dollars) from on line vendors.
Prerequisite	Math 1050 or higher, Chemistry 1210
Course description	Chemistry 1220 is the second of a two semester sequence of general chemistry for students in the physical and biological sciences and engineering. The course will cover topics presented in chapters 14-25 of the Brown, Lemay and Bursten text.
Distance Education	This section of chemistry 1220 is being offered via distance education. All lectures and tutorials (prerecorded), office hours, course materials and assignments (quizzes and exams) will be administered online through the Canvas instructure system. After registration, you will receive instructions for logging into Canvas from the web address: https://usu.instructure.com/ . Note: Canvas will not be available to you until the first day of class.
Computer requirements	It is imperative that you have access to a computer with an internet connection, webcam, and microphone, and an up to date google chrome browser (Chrome is required for using proctorio in canvas) with the necessary plug-ins to play mp4/m4v video files . Exams will be taken on your computer using proctorio (instructions to follow later).
Learning Management System and class resources	Canvas instructure will be used for the management of Chem. 1220. <i>You will also take your on line chapter quizzes and exams using Canvas.</i> To log on to Canvas, go to the web address: canvas.usu.edu , then select the course page for Chemistry 1210. Your USERNAME is your BANNER login and your default PASSWORD is your BANNER password. You will access class resource materials (lecture overheads, lecture recordings, current exam keys, practice exams, end-of-chapter text solutions, etc.) from a link on the main Canvas course page titled "chemistry 1220 essential resources". The direct link is: http://ensignchemistry.com/chemistry%201220%20preview/chemistry1220resources/resources.htm The username and password for these pages are posted on the main Canvas page.

Lecture

Copies of my lecture overheads will be posted as PDF files. You may want to

Overheads and recordings download and print out the appropriate overheads before listening to lecture, and have the print copies with you while you listen to lectures. Video recordings for lectures and tutorials are provided as mp4 files that play in your browser using flash or html.

Lecture content The number of lectures presented, and the content of lectures, will parallel the lecture content for the on-campus sections of chemistry 1220. This corresponds to approximately 39 “50 minute “lecture periods” presenting and explaining the principles summarized on the class schedule and developing problem solving skills, with an associated 50 minute recitation lecture for each 3 formal lectures (see description below).

Recitation lectures and on-line tutorials For each chapter, and as review sessions prior to exams, there will be additional “recitation lecture” components which will focus solely on developing problem solving skills by working through problems similar to those you will encounter on your quizzes and exams. These “recitation lectures” will consist of a series of “on-line tutorials” containing solutions to selected textbook, sample quiz, and practice exam problems. All of these materials will be provided to you in the same format as the lecture recordings, where I work problems using a digitizer tablet which records my problem solving with voice over so you can watch and listen to the problem solving strategy in real time. What you will see on your computer screen is the equivalent to a classroom whiteboard with solutions being worked as if with a dry erase marker.
Please note: if there are specific problems from practice exams or quiz problems that you would like me to work and post as “on-line tutorials”, simply email me or post a request to the discussions board and I will make an on-line solution to that problem for you.

Completion of assignments The course officially runs in the 7 week block from 05/10/21 to 06/25/21. You must complete all assignments: 12 quizzes, three midterms, the optional comprehensive makeup exam, and a final examination within that time period. I will provide some flexibility in when assignments must be completed to accommodate your summer vacation and work schedules (see attached schedule). Per instructions from the distance education office, all assignments must be completed by the end of day June 25. Please use the attached class schedule as a guide, and pace yourself properly. I recommend that you do not procrastinate taking the chapter quizzes, as they are an essential part of mastering the course material. A recommended sequence for each chapter is (1) print and look over the lecture overheads, (2) watch the lecture recordings, and use the textbook as needed to reinforce the lecture principles, (3) take the chapter self test (non-graded), (4) watch the on line solutions for the chapter self test, (4) take the first quiz attempt, (5) review the submitted quiz, (6) repeat steps (4) and (5) for your remaining quiz attempts. You may wish to save your last of your five quiz attempt as final preparation for the exam.

**Quizzes
(graded)**

There will be 10 chapter quizzes offered throughout the semester. Each quiz counts 10 points, is open book and consists of between 10 and 15 questions. You will take the quizzes on line through Canvas. You will have 30 minutes to take each quiz. You may repeat a given quiz up to four additional times during the availability period (indicated in Canvas) to improve your grade on that particular quiz, if you wish. Your highest score for the five attempts will be recorded. Note that each time you take a quiz you will receive a slightly different version, covering the same concepts but with different questions. I encourage you to take each quiz the full five times, as the problem solving skills you will gain from taking the quizzes multiple times will be very beneficial in preparing for the exams. Remember, there is no penalty for repeating a quiz; your highest score of all attempts is the one that will be entered into the gradebook. The deadlines for taking the quizzes will match the deadlines for the exams that cover the material on the quizzes. Quizzes 1-3 cover midterm 1 materials, quizzes 4-5 cover midterm 2 material, quizzes 6-8 cover midterm 3 materials, and quizzes 9-10 cover the new material section of the final exam).

**Midterm
Exams
(graded)**

Three hourly exams (100 points each) consisting of 25 multiple choice questions will be given on line using proctorio within the “time windows” indicated on the course schedule. *Please read the instructions for taking proctored exams in the “Support” section of Canvas.* The examination formats will be the same as the on-campus sections of Chemistry 1220, with 25 questions worth 4 points each. You will be given 75 minutes to complete the midterm exams. The multiple choice exams are based on material covered in the on-line lectures, which will largely follow the organization of the chapters in the course text. **Many if not all of the exam questions will come directly from the chapter self test and chapter quiz questions,** so I strongly encourage you to work through each chapter self test, watch the accompanying tutorials for these self tests, and take each chapter quiz five times, even if you score perfectly on your first attempt. Your performance ultimately depends on your proficiency under testing conditions.

On line make-up exam (can substitute for lowest midterm score)

An optional “make-up exam”, covering all of the material covered on midterms 1-3 and worth 100 points, will be offered towards the end of the semester. If you score *higher* on this exam than on your lowest of three in-class midterms, the score will replace the lowest midterm score. If you score *lower* on the make-up exam than on all three of your in-class midterms, then this exam score will not count. You are strongly encouraged to take the make up exam as preparation for the final exam, and as a mechanism for improving your score on one of the three midterm exams. There is no penalty for taking the makeup exam, it can only help you.

Final exam

The final exam (200 points, to be completed in 140 minutes) will be given in the time period indicated on the class schedule. The final exam will consist of 50 questions, and contain both a “new material” section (80 points, material covered since exam 3) and a “comprehensive portion” (120 points, material covered on exams 1-3).

Grading

A total of 600 points are possible in Chem. 1220 and are distributed as follows:

Total of 3 in-class midterms, or best two midterms and the on-line make-up exam.	300 pts.
10 on-line quizzes @ 10 points each.....	100 pts.
Comprehensive Final Exam.....	200 pts.

Total points	600 points

In terms of final assignment of grades, you are *guaranteed* the following grades if your final class percentage lies within the indicated ranges:

A/A-	100 to 88.00% (93.00 % or above is a guaranteed straight "A")
B+/B/B-	<88.00 to 77.00%
C+/C/C-	<77.00 to 60.00%
D+/D	<60.00 to 50.00%

Based on the overall class average, the **percentage cuts for the various grades may shift lower than the above cuts**. In other words, better grade may be assigned for lower percentages than those indicated above, a scenario that is *to your favor*. However, the percentages will never shift higher than the above, so you are assured the indicated or a higher grade, depending on the class average at the conclusion of the course.

In general, in order for grade breaks to be dropped lower than those indicated above, the overall class average on all assignments would be below 75%.

Provisions:

The administration of Chem 1220 will adhere strictly to the regulations outlined in the Summer semester schedule of classes and by the distance education program. Visit them at <http://distance.usu.edu/>
Answers to frequently asked questions about distance education teaching are available at: <http://distance.usu.edu/htm/faqs>

In accordance with the Americans with Disabilities Act, reasonable accommodations will be provided for all persons with disabilities in order to ensure equal participation in Chem 1220. In cooperation with the Disability Resource Center, reasonable accommodation will be provided for students with disabilities. Please contact the instructor during the first week of class to make arrangements. Alternative format print materials, large print, audio, diskette or Braille, will be available through the Disability Resource Center.

The following is a tentative schedule for completing lecture topics and assignments. Note that you will be working at your own pace, but the four midterms must be taken within the indicated time frames, and all assignments (including the final exam) must be submitted before the last day of class (6/25).

Week	Date	Lectures (posted at this link)	Text Chapter	Quiz (Chapter)	Exam
1	5/10 to 5/15	Section 1: Kinetics, parts 1-5 Section 2: Chemical equilibrium, part 1	12 13	1 (14)*	
2	5/17 to 5/22	Section 2: Chemical equilibrium, parts 2-3 Section 3: Acid-base equilibrium, parts 1-8	13 14	2 (15)* 3 (16)*	Exam 1, sections 1-3: open 5/19 to 5/22
3	5/24 to 5/29	Section 4: More aqueous equilibrium, parts 1-8 Section 5: thermodynamics, part 1	15 16	4 (17)*	
4	5/31 to 6/5	Section 5: thermodynamics, parts 2-4 Section 6: electrochemistry, parts 1-3	16 17	5 (19)* 6 (20)*	Exam 2, sections 4-5: open 6/2 to 6/5
5	6/7 to 6/12	Section 6: electrochemistry, parts 4-7 Section 7: Nuclear chemistry, parts 1-4	17 21	7 (21)*	
6	6/14 to 6/19	Section 8: nonmetals, parts 1-3 Section 9: metals and coordination chemistry, parts 1-2	18 19	8 (22)* 9 (23)*	Exam 3, sections 6-8: open 6/16 to 6/19
7	6/21 to 6/25	Section 9: metals and coordination chemistry, parts 3-5 Section 10: organic chemistry, parts 1-3	19 20	10 (24)* Extra credit quiz*	Comprehensive makeup exam: open 6/19-6/25
Comprehensive final exam: 20 questions new material from sections 9-10, 30 questions material from sections 1-8 – open through 6/25					
*chapter quiz due dates are posted in canvas instructure					

Chemistry 1220 Learning objectives

Describe reaction rates in terms of zero, 1st, 2nd, 3rd order processes
Describe reaction rates as a function of temperature
Predict reaction half-lives given initial conditions
Differentiate between the plots of 1st order and 2nd order reactions
Describe the action of catalysis on a chemical reaction
Describe reactions in terms of elementary steps and rate-determining steps
Write equilibrium constant expressions
Perform calculations of concentrations, pressures using K_{eq} information
Predict the direction of a reaction using the reaction quotient
Explain Le Chatelier's Principle
Cite essential definitions of acids and bases
Utilize the autoionization of water to define pH and pOH, K_w , pK_w
Employ K_a , K_b values to calculate pH, pOH of solutions of weak acids, weak bases, and salts
Describe chemical factors that contribute to the strength of acids and bases
Apply concepts of the Common Ion effect to design and construct acid/base buffer systems
Calculate acid/base titration curves and predict end-point conditions
Describe and apply K_{sp} values to determine solubility of inorganic solids
Describe the precipitation and separation of ions utilizing K_{sp} information
Describe the chemical composition of the Earth's crust, atmosphere, and surface waters
Describe chemical reactions in the atmosphere caused by solar radiation
Describe chemical reactions related to acid rain
Describe and apply concepts of chemical spontaneity and the 2nd Law of Thermodynamics
Describe and apply the concepts of entropy to chemical reactions
Use Gibb's Free Energy to predict chemical equilibrium
Balance chemical reactions that involve changes in oxidation states
Express oxidation/reduction in terms of half reactions
Describe voltaic cells and calculate potentials using standard reduction potentials
Predict the spontaneity of oxidation/reduction reactions
Employ the Nernst Equation to calculate cell potentials and chemical concentrations
Describe the essential reactions related to common battery systems and fuel cells in use today
Describe the chemical reactions of corrosion
Describe and differentiate between fundamental types of radioactivity and radioactive processes
Predict nuclear stability based on proton/neutron ratios
Apply 1st order kinetics for radioactive decay
Compare the energetic and mass aspects of nuclear fission and nuclear fusion
Describe the fundamental aspects of the reactivity of non-metal elements
Identify the major chemical processes for purifying iron, steel, aluminum, copper, and sodium
Describe the structure and bonding in simple coordination complexes of transition metals like Fe, Cu
Predict simple electronic configurations for transition metal ions using the periodic table
Predict magnetism using simple models of Crystal Field Theory
Discuss how the color of transition metal complexes is related to d-orbital splitting
Identify and draw the structure of hydrocarbon alkanes, alkenes, alkynes, and aromatics
Identify and draw the organic functional groups ethers, aldehydes, ketones, acids, esters, and amides
Identify the chemical structure of amino acids and polypeptides

Identify the chemical structure of carbohydrate sugars and fats Identify the chemical structure of nucleic acids and DNA, RNA