

CHEM 1220 – Principles of Chemistry II

Syllabus

Instructor: Dr. Shawn M. Miller

Fall Term, 2021

Email: shawn.miller@usu.edu

Office Hours: T/R 2:00 PM – 3:00 PM and by appointment

Location: Online via Zoom – See Course Communication section for details

Prerequisite:

CHEM 1210

Required Materials:

Calculator: A non-programmable scientific calculator is recommended for use on Exams. Other electronic devices, including phones, are not permitted during Exams.

Homework: Chem101 online homework system. Access is automatic upon paying of course fees, but you will need to create an account for the service. Follow the Chem101 Enrollment instructions document on Canvas under the “Chem101 Access” module.

Optional Materials:

Text: Brown, LeMay, Bursten, Murphy, Woodward, Stoltzfus *Chemistry: The Central Science*, 13th ed.; Pearson Education, Inc. (ISBN: 978-0-321-91041-7) (earlier editions are fine).

Supplementary Course Assistance:

This course provides an SI and UTF in addition to the course Teaching Assistant (TA) to provide supplementary assistance to the main Lecture period and instructor Office Hours. Attending these sessions are completely optional, but you are strongly encouraged to make use of these resources.

SI Information: Alex Hill (contact: a02278175@usu.edu or Canvas)
Session Times: M/W 5:00 PM – 6:00 PM via Zoom

UTF Information: Kaden Christensen (contact: kaden.t.christensen@aggiemail.usu.edu or Canvas)
Session Times: T/R 5:00 PM – 6:00 PM via Zoom

Course Overview

CHEM 1220 is the second in a two-semester series of general chemistry courses that is targeted towards science and engineering students and builds upon the lessons learned in CHEM 1210. This section is structured in an online format where presentation of content and practice problems are delivered via recorded lectures that also contain simple reading check questions. There are online Chem101 homework assignment and online Canvas Post-week Quizzes, which are designed to prepare students for the Exams. There are three 90-minute Midterm Exams in addition to a 180-minute Final Exam all of which are administered on Canvas using Proctorio.

By the end of this course, you will be able to...

- ...describe science as a process for discovery.
- ...list key fundamental chemistry theories and principles.
- ...use fundamental chemistry theories and principles to explain or predict a result when presented with a chemistry scenario.
- ...identify and use the appropriate equation(s) and problem-solving tool(s) needed to solve a chemistry problem.
- ...calculate and correctly write scientific values using algebra and other fundamental mathematical skills.

A detailed set of Learning Objectives for each chapter is located at the end of this syllabus.

You will prepare for and practice achieving these objectives by...

- ...optionally reading the optional textbook prior to watching recorded lectures.
- ...watching, taking notes, and answer Reading Check Quiz questions during recorded lectures.
- ...completing Chem101 homework problems online.
- ...taking graded online Canvas Post-week Quizzes.
- ...regularly reviewing your performance on the Homework and Post-week Quizzes.
- ...asking for help via Zoom Meetings, Piazza, Canvas message, or e-mail.
- ...optionally attending UTF or SI sessions for problem solving and further assistance.

You will be assessed on how you have achieved these objectives using...

- ...one Getting Started Quiz on Canvas.
- ...the aforementioned Reading Check questions.
- ...the aforementioned Chem101 homework sets.
- ... the aforementioned Post-week Quizzes on Canvas.
- ...three Midterm Exams.
- ...one Final Exam.

Course Communication

Piazza is the recommended venue for asking academic questions about the course. Piazza is a free online system that can be accessed directly through Canvas and is designed for students to have access to rapid help from classmates, supplemental assistance (UTF, SI, TA), and the course instructor simultaneously. **Piazza is not to be used to convey personal information.** Contact the instructor directly if you need to discuss personal information such as grades.

When a question is posted on Piazza, students and the course instructor can all answer the question. This makes a rapid response more likely compared to emailing one person and hoping they read it soon. Often, a student asks a question another student was going to ask, and the second student finds their question already answered on Piazza! Students have the option of posting anonymously to each other, but the instructor and teaching team will always be able to see user identity. **Enrollment in Piazza is mandatory, and five points are assigned to Piazza enrollment. Usage of Piazza during the term is optional.** Enroll in the course by clicking on the “Piazza” link in the sidebar on Canvas and following the instructions there. The deadline for enrollment is 11:59 PM on the Wednesday of Week 1 of the term.

Due to how Piazza licenses its product, this term a “contribution-supported” license is used to keep the service free. Piazza will prompt users provide a financial contribution if they find the experience valuable. **Students are under no obligation to provide monetary support to Piazza and may use the service for free throughout the course by ignoring the donation prompts.**

Students are always welcome to message the instructor directly with questions. Canvas messages are preferred, but email is fine as well. When messaging via email, students should include their full name, their A-Number, and the course name in their message. I will respond to messages in a timely manner, but I may not be able to respond immediately as I have responsibilities outside of the course.

The instructor will hold regular online office hours via Zoom and sessions can be accessed via the link in the Canvas course sidebar. Regular Office Hours will first be held during Week 2 of the semester, but Office Hours by appointment may be possible during Week 1.

Course announcements are made using the Canvas Announcements system. Students are expected to keep up-to-date on all Canvas Announcements and are responsible for any information in the Announcements. “But I did not know” is not an acceptable excuse for being unaware of information in course Announcements.

Getting started in the course

Read the course syllabus. Once that is done, the first assessment is a “Getting Started” quiz administered through Canvas that covers course policy as discussed in the course syllabus. This Quiz is due at 11:59 PM on the Friday of Week 1 of the term. The Getting Started quiz is graded immediately upon completion and may be attempted an unlimited number of times. Correct answers will not be shown upon completion of the Getting Started Quiz, but students will be able to view their responses. If multiple attempts are made, the **highest** score is accepted. **If no score is present in a student’s Grades, no attempt was submitted.** The Getting Started Quiz score cannot be dropped and cannot be made-up.

USU welcomes students with disabilities. If you have, or suspect you may have, a physical, mental health, or learning disability that may require accommodations in this course, please contact the Disability Resource Center (DRC) as early in the semester as possible (University Inn #101, 435-797-2444, drc@usu.edu). All disability related accommodations must be approved by the DRC. Once approved, the DRC will coordinate with faculty to provide accommodations.

Lectures

Students with access to the optional textbook are strongly encouraged to read the relevant sections prior to watching the recorded lectures. Students are not expected to understand the material simply by reading the textbook, but reading the text will build a foundation that is expanded and refined through the recorded lectures. Blank lecture PowerPoint slides are available on Canvas and can be printed. The online format of this course allows for some flexibility for when students watch recorded lectures. The danger of this flexibility is falling behind and trying to cram weeks’ worth of material before an Exam. **Students are strongly encouraged to create and keep to a regular schedule to watch the recorded lectures and not fall behind on material.**

Recorded lectures will have a “Reading Check” question embedded in them. Reading Check questions are designed to be simple and students may attempt them only once. At the end of the term, correctly answering Reading Check questions are worth 50 points. These points are awarded based on the **percentage** of Reading Check questions answered correctly. To provide some flexibility, only 80% of Reading Check questions must be answered correctly to earn the full 50 points. For example, if there are 100 Reading Check Questions, then answering 80 or more correctly will earn 50 points. Answer 40 Reading Check Questions correctly (50% of 80 questions) will earn 25 points (50% of 50 points). Reading Check questions are generally due at 11:59 PM two days after the final recorded lecture for the chapter they are associated with is scheduled but check Canvas for specific due dates.

Chem101

Chem101 is an online homework service used this term. Access is automatic upon paying of course fees, but you will need to create an account for the service. Follow the Chem101 Enrollment instructions document on Canvas in the “Chem101 Access” module. **You must access Chem101 through the Canvas link.** Each chapter section will have a Chem101 homework assignment that is worth 5 points. These assignments are designed to provide additional practice to help you prepare for the quizzes and exams. The assignments will typically be due at 11:59 PM two days after the chapter section is completed in Lecture. The lowest 2 homework assignment scores are dropped at the end of the course.

Quizzes

A Post-week Quiz is assigned following most weeks this term. The Quizzes will open at 12:00 AM each Friday and close at 11:59 PM the following Monday. Holidays and other events may affect due dates so check Canvas for specific due dates. Post-week Quizzes are worth 15 points. Students have 60 minutes to complete each Post-week Quiz. Students may use their textbook and notes, but must work alone. Students should treat Post-week Quizzes as practice for the Exam in terms of both format and content and it is strongly recommended that students do not use external resources on their first Quiz attempt so as to more accurately gauge their understanding of the material. Students may take each Post-week Quiz twice to account for technical difficulties. The **highest** score is accepted. Discussion of Quiz details with other students while the Quiz is open is a violation of USU's academic integrity policy as detailed below. The lowest two Post-week Quiz scores are dropped at the end of the course.

Examinations

There are three 60-minute Exams, worth 100 points each, administered on Canvas via Proctorio according to the following schedule:

First Exam:	Wednesday, September 29 to Friday, October 1
Second Exam:	Wednesday, October 27 to Friday, October 29
Third Exam:	Monday, November 22 to Wednesday, November 24

These Exams will consist of 25 questions worth 4 points each. Question formats may include, but are not limited to, multiple choice, multiple answer, matching, short essay, and fill-in (dropdown and text). Students must complete Exams alone. As Exams are open over multiple days, discussion of Exam details with other students while the Exam is open is a violation of USU's academic integrity policy as detailed below.

Make-up Exams for missed Exams may be granted upon petitioning the instructor only in the following situations: 1) documented and acceptable excuses for illness when verified by a doctor's note; 2) a family emergency when verified by a note from your academic advisor; 3) a regularly scheduled university-sanctioned conflict, such as a sports competition the student is participating in, but only when the instructor is notified well in advance of the conflict and verified with a note from the person in charge of the activity containing the specific reasons for the absence. Absences due to reasons not considered by the university to be excused absences, such as weddings, are not eligible for make-up Exams.

The only student materials permitted during Exams are writing utensils, calculators, scratch paper, and Useful Information Sheets. To enforce a standard set of exam conditions, a service called Proctorio is used to administer all Exams. Information on how to install and use Proctorio can be found through this link: <https://cidi.usu.edu/student-support-resources/proctorio-overview>. Proctorio requires the use of a camera and microphone, which many modern laptops come built with, and a reliable Internet connection. **If personal circumstances preclude using Proctorio, please contact the instructor directly.** There is an ungraded Quiz on Canvas called "Proctorio Test Quiz" in the "Logistical Assignments and Extra Credit" module that can be used to test the ability to use Proctorio.

A 120-minute cumulative Final Examination will be administered on Canvas via Proctorio from Monday, December 13 to Wednesday, December 15.

Academic Integrity

All Utah State University academic integrity policies are strictly enforced. All students at Utah State University agree to be bound by the following Honor Pledge "I pledge, on my honor, to conduct myself with the foremost level of academic integrity." See the following for further information: <https://studentconduct.usu.edu/studentcode/article5>. Students found guilty of academic misconduct on any assignment will, **at minimum, be given a zero for the assignment and have the full value of that assignment deducted from their final course grade.** Actions up to and including a failing grade for the course are options available to the instructor.

Course Assessment

After the first Exam, the instructor will solicit feedback through optional midterm evaluations on Canvas. The purpose of these surveys will be to determine student opinions of the course up to that point and ask for suggestions on what could be done to improve the course for the rest of the term and in subsequent terms. The instructor will know who completed the survey, but will be unable to match survey responses to students. Each student who responds to the midterm evaluation will be granted a small quantity of extra credit points. At the end of the course, end-of-term IDEA evaluations administered through University will be sent to students via email. The instructor will know who completed the survey, but will be unable to match survey responses to students. Each student who responds to the end-of-term evaluation will be granted a small quantity of extra credit points.

A Pre-test/Post-test approach will be used to measure comprehension and teaching of important concepts. The Pre-test will be administered online through Canvas. The Pre-test will be comprised of 20 questions with a duration of 90 minutes. The questions of the Pre-test will reappear in the Final Exam, in some form, to assess teaching and learning progress during the semester. If weaknesses are observed in specific subject areas, teaching methods will be reevaluated. 10 points will be given for completing the Pre-test. The Pre-test is due at 11:59 PM on the Friday of Week 1 of the term.

Grading

The total score for each type of assignment represent totals after appropriate lowest scores have been dropped.

Getting Started Quiz	20	Percentage of Points Earned	Grade
Piazza Enrollment	5	93-100	A
Pre-test	10	88-92	A-
Reading Check Questions	50	85-88	B+
Chem101 Homework	40	81-84	B
Post-week Quizzes	150	77-80	B-
First Exam	100	73-77	C+
Second Exam	100	66-72	C
Third Exam	100	60-65	C-
Final Exam	200	56-59	D+
Total points	875	50-55	D
		< 50	F

Letter grades are assigned by taking the total numerical score, rounding to the nearest whole number, finding the percentage of total points earned, and then assigning a letter grade according to the table above. A grade of 93 or higher is guarantee an "A". The grade thresholds may be lowered depending on course performance, but will never be increased. The administration of CHEM 1220, including the issuing of grades of Incomplete, will adhere to the outlines in the USU General Catalog.

Fall 2021 Schedule

Please look carefully at the following schedule for the correct order of Lectures. Note that this schedule is approximate and may adjust slightly depending on course pace.

Purple text denotes days set aside for studying for and/or taking Exams and have no assigned lectures. **Blue text** denotes school holidays and have no assigned lectures.

Week	Day	Date	Lecture Day	Topic	Chapter	Assignment Due	
1	M	8/30	1	Course intro, reaction rates	14		
	W	9/1	2	measure rate, rate laws	14		
	F	9/3	3	integrated rate laws	14	GS Quiz/Pre-Test	
2	M	9/6	Labor Day – No Lectures				P-Quiz 1 (Tues.)
	W	9/8	4	collision model, activation energy	14		
	F	9/10	5	mechanisms, catalysts	14		
3	M	9/13	6	Equilibrium constants	15	P-Quiz 2	
	W	9/15	7	Le Chatelier's Principle	15		
	F	9/17	8	acid/base fundamentals	16		
4	M	9/20	9	K_w , pH, strong acids/bases	16	P-Quiz 3	
	W	9/22	10	weak acids, K_a	16		
	F	9/24	11	weak bases, K_b , salts	16		
5	M	9/27	12	strength factors, Lewis acids/bases	16	P-Quiz 4	
	W	9/29	First Exam (Ch 14-16)				
	F	10/1	13	common ions, neutralization intro	17		
6	M	10/4	14	titrations	17		
	W	10/6	15	titrations, buffers	17		
	F	10/8	16	Henderson-Hasselbalch equation	17		
7	M	10/11	17	solubility and K_{sp}	17	P-Quiz 5	
	W	10/13	18	solubility factors	17		
	F	10/15	Fall Break – No Lectures				
8	M	10/18	19	energy review	19	P-Quiz 6	
	W	10/20	20	entropy	19		
	R	10/22	21	Gibbs Free Energy	19		
9	M	10/25	23	ΔG at nonstandard, ΔG at equilibrium	19	P-Quiz 7	
	W	10/27	Second Exam (Ch 17-19)				
	F	10/29	24	Redox equations	20		
10	M	11/1	25	Voltaic cells	20		
	W	11/3	26	EMF	20		
	F	11/5	27	EMF and free energy + equilibrium	20		
11	M	11/8	28	batteries, electrolysis, nuclear intro	20	P-Quiz 8	
	W	11/10	29	radioactivity, nuclear decay/transmutation	21		
	F	11/12	30	radiochemistry applications, nuclear energy changes	21		
12	M	11/15	31	applications of nuclear energy, radiation in environment	21	P-Quiz 9	
	W	11/17	32	hydrogen, noble gases, halogens, oxygen	22		
	F	11/19	33	nitrogen, carbon, boron	22		
13	M	11/22	Third Exam (Ch 20-22)				P-Quiz 10
	W	11/24	Thanksgiving Break – No Lectures				
	F	11/26	Thanksgiving Break – No Lectures				
14	M	11/29	34	transition metals, metal complexes	23(23,24)		
	W	12/1	35	metal complex formulas, ligands, isomers	23(23,24)		
	F	12/3	36	crystal field theory, organic intro	23+24(25)		
15	M	12/6	37	hydrocarbons, functional groups	24(25)	P-Quiz 11	
	W	12/8	38	functional groups, proteins	24(25)		
	F	12/10	39	proteins, carbohydrates, lipids, nucleic acids	24(25)		
16	M/T/ W	12/13 – 12/15	Final Exam (cumulative)			P-Quiz 12 (due M)	

For BLB 12th edition chapters 23 and 24 are combined as chapter 22, and organic chemistry is chapter 24. For earlier editions chapters 23-25 cover the material in chapters 23-24 of the 12th edition

Chapter Learning Objectives

Chapt 14: 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

Chapt 15: 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

Chapt 16: 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

Chapt 17: 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

Chapt 19: 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

Chapt 20: 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

Describe the chemical reactions of corrosion

Chapt 21: 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

Chapt 22: Describe the fundamental aspects of the reactivity of non-metal elements, including hydrogen, the Noble gases, the halogens

Chapt 23: 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

Chapt 24: Identify and draw the structure of hydrocarbon alkanes, alkenes, alkynes, and aromatics

Identify and draw the functional groups ethers, aldehydes, ketones, acids, esters, and amides

Identify the chemical structure of amino acids and polypeptides

Identify the chemical structure of carbohydrates, sugars, and fats

Identify the chemical structure of nucleic acids and DNA, RNA