



General Chemistry II
CHEM 1020-3 (CRN 2561)
Winter Quarter, 2022

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Class Time: MWF 9:00 – 9:50 AM via Zoom (live, synchronous + recorded → eventually in Olin 205?)
Recitation: Th 9:00 – 9:50 AM via Zoom (live, synchronous + recorded → eventually in Olin 205?)
Office Hours: To be determined (via survey) and announced during first week
Help Room: Staffed by learning assistants (LAs) throughout the week in Anderson Academic Commons.
See here for more information and schedules: <http://portfolio.du.edu/sec>  [@SELCatDU](#)

REQUIRED COURSE ITEMS

Textbook: *Chemistry: The Molecular Nature of Matter and Change, 9th Edition, Silberberg & Amateis, McGraw-Hill Publishers*
McGraw-Hill software: *Connect* with SmartBook (comes with eBook)

From DU Bookstore or McGraw-Hill website:

<https://www.mheducation.com/highered/product/chemistry-molecular-nature-matter-change-silberberg-amateis/M9781260240214.html>

You may buy an older copy of the Silberberg text, but a *Connect* account is still required.

Calculator: You will need an inexpensive calculator that has the capability for square roots, logarithms, and exponents. You are responsible for understanding how to perform these operations on your calculator. **Please bring your calculator with you to every class.**

COURSE DESCRIPTION

Chemistry 1020 is the second quarter in the General Chemistry series. With CHEM 1010, this course will provide a broad basis for the fundamental knowledge needed to succeed in higher-level chemistry courses (organic chemistry, analytical chemistry, biochemistry, environmental chemistry, and physical chemistry) as well as a solid foundation for many other disciplines. CHEM 1010 is a pre-requisite for this course, and it is assumed that you have taken this course (or equivalent) prior to taking CHEM 1020. If your situation is slightly different, you may have to put in a little more work at the beginning of the course until you have the necessary background.

The lectures will be somewhat general and it will be up to YOU to fill in the gaps to truly understand the details. **BOTTOM LINE:** Pace yourself and continuously work from beginning to end. Even if you think a topic is easy, I recommend that you put in extra time to make sure you understand the details that may not be presented in lecture. Students who have learned to work at a steady pace have been shown to perform better (and not be as stressed at the end!). Generally speaking, students are expected to put in 2-3 hrs outside of class per credit (this is why 12 hrs is considered a “full load”). CHEM 1020 is a 3-hr course, so the class is designed such that ~ 6-9 hrs of your time outside of class is devoted to this course!

COURSE OBJECTIVES & KEY SKILLS

- Thermodynamics: Describe & apply the 1st, 2nd, and 3rd laws of thermodynamics. Students will be able to calculate enthalpy/entropy/Gibb's free energy and relate these calculations to laboratory predictions and measurements.
- Equilibria & Thermodynamics: Relate Gibb's free energy to the spontaneity of a reaction and calculating the equilibrium constant. Equilibria will be applied to Solubility problems.
- Acid & Base Equilibria: Predict the extent of a reaction applied to acids & bases. Students will be able to predict the pH of a solution with strong, weak, and polyprotic acids & bases.
- Buffer Solutions: Demonstrate foundational knowledge of buffers both in our world, especially in a biological context. Students will be able to derive and apply the Henderson-Hasselbach equation to make predictions about buffer solutions, and to design buffers. Determine principle species at a specific pH.
- Titrations: Demonstrate foundational knowledge of the uses of titrations as an analytical tool to gain information about an unknown solution. Students will be able to apply their knowledge of acid/base chemistry & buffer solutions to predict/calculate pH at any point along the titration curve.
- Kinetics: Describe the factors that affect the speed of a chemical reaction. Demonstrate understanding of the connection and also differences between thermodynamics and kinetics of a chemical reaction. Determine the order of a chemical reaction through experimental methods as well as theoretical mechanisms.
- Practice systematic logic and problem-solving


LECTURE

The format of the class meetings will follow traditional lecture format on MWF. I will summarize new material and present illustrations and examples. You will be encouraged to practice problems during and after lectures. I will NOT be able to identify and describe every detail you read in the text and any supplemental materials. You will be expected to finish and understand assigned readings even if I have not gone over that material in great detail. However, I will emphasize important topics covered in the reading as well as problem solving strategies when appropriate. Please stop me at any time if you have questions.

The Thursday (Th) recitation meeting will be devoted to review, problem solving, group activities, in-class assignments and quizzes. On most occasions, no new lecture material will be covered on these days. However, material from the lecture will be explored in greater detail. *Assignments for credit may be given and worked during recitation.*

OFFICE HOURS & HELP CENTER

I will post hours when I will be available in my office for questions or issues related, or unrelated, to the course. These hours may be changed, if necessary, during the quarter, but this will be announced.

Need extra help? The *Science and Engineering Learning Center* is a collaborative space staffed by undergraduate and graduate learning assistants (LAs) trained to assist students with some first and second year biology, chemistry, physics, computer science and engineering courses. They offer support for both lecture and laboratory courses for certain courses, CHEM 1020 included. Their goal is to help students grow as problem solvers by assisting with homework sets, lab reports, and preparing for exams. The Science and Engineering Learning Center is **not** a one-on-one tutoring center, but is rather a support system where students can get guidance from LAs as well as their peers. This center is open to all DU students. All services are free. See <http://portfolio.du.edu/sec> for a complete schedule. Please also follow them Twitter for the most up-to-date announcements:  @SELCatDUREADING

You are encouraged to compete the assigned reading prior to the class lecture and often again after the lecture. In addition, you are also encouraged to attempt the example exercises throughout the text while completing the assigned reading. I recommend that you understand the material and how to solve the sample problems before proceeding to the next section. At the end of each chapter, a summary of important equations and terms is provided that should prove helpful in preparation for quizzes and/or exams.

ONLINE READING & HOMEWORK ASSIGNMENTS

Homework (HW) problems will be assigned to be worked and turned in (electronically) weekly. The tentative due dates are listed in the syllabus schedule. Unless otherwise discussed, *Connect* homework will always be due by 7 AM on the assigned date.

Weekly SmartBook (SB) reading assignments will also be assigned via the McGraw-Hill *Connect* platform. These will generally be due by 7 AM on the assigned date, unless otherwise stated. Each assignment will show an estimated time for completion. This number is misleading and only reports the time associated with working out the questions. As an aside, the first five students to actually read this and contact me will get bonus points. You may need to budget 2-4x the amount of time for these reading assignments.

OTHER GRADED ASSIGNMENTS

Supplementary assignments may periodically be assigned.

PARTICIPATION / ENGAGEMENT

Due to the (partially?) remote nature of this course, participation points may be assigned in a variety of ways that will be discussed periodically through the course. This is to encourage interaction with each other and the instructor. These points may be assigned for participation in lecture, recitation, or office-hours.

QUIZZES

Four (4) quizzes will be given during the quarter. Questions will be comprised of material from lecture, homework, and reading, but will NOT be identical to those on the homework or in class. Some questions will specifically be designed to challenge your thinking ability. Four quizzes will be given, the lowest score of which will automatically be dropped. All four quizzes/exams will count equally.

FINAL EXAM

A final exam will be given. It may or may not be optional, with procedural details to be discussed at least several weeks in advance. Given that the course is starting online and may or may not return to in-person, some flexibility will be retained until we see how the course develops.

GRADES

At the end of the quarter, you will be graded according to your performance per the break-down listed below. Cooperative learning is encouraged, but will not be allowed on quizzes or exams. Your final grade will be determined by the percentage with the following components and scale. I will not grade on a curve, but grades in other course sections will be monitored and grades may be slightly increased if necessary in some cases.

Component	Approx. Points (Each)	Approx. Points (Total)	Approx. Percentage (Total)
Weekly homework (Connect)	10	100	29%
Smartbook (interactive reading)	-	50	14%
Quizzes (top 3 of 4)	50	150	43%
Misc. Assignments & Engagement		50	14%
Final Exam	-	TBD	TBD
<i>Total</i>	-	350	100%

Final Letter Grade	Minimum Percentage
A	94%
A -	90%
B +	87%
B	84%
B -	80%
C +	77%
C	74%
C -	70%
D +	67%
D	64%
D -	60%
F	<60%

IMPORTANT DATES

January 3: Classes begin, Winter Quarter

January 9: Last day to drop classes for full refund or without W

January 17: Martin Luther King Jr. Holiday (no class)

* **February 27: Last day to drop** (for "W"), requires approval (8th week)

March 14: Last day of classes

DU Academic Calendar: <http://www.du.edu/registrar/calendar/index.html>

CELLULAR PHONE AND MOBILE DEVICE POLICY

I respect the need for each individual to stay in contact with family and friends. The use of mobile devices, however, is disruptive to the learning environment. Thus, I request that the ringers of all cellular phones and other mobile devices be muted during class. If an emergency arises, and you need to make a call on your phone, I request that you quietly leave the room and conduct your conversation out in the hallway.

LECTURE AND TESTING ACCOMODATIONS

I will make every effort to accommodate students diagnosed with a learning disability. I will do this in complete confidence. I request that any student requiring these accommodations inform me the first week of class. For further information, please see the University Disability Services' website:

<http://www.du.edu/disability/dsp/index.html>.

RELIGIOUS ACCOMODATION

University policy grants students excused absences from class or other organized activities or observance of religious holy days, unless the accommodation would create an undue hardship. Faculty are asked to be responsive to requests when students contact them *in advance* to request such an excused absence. Students are responsible for completing assignments given during their absence, but should be given an opportunity to make up work missed because of religious observance.

Once a student has registered for a class, the student is expected to examine the course syllabus for potential conflicts with holy days and to notify the instructor by the end of the first week of classes of any conflicts that may require an absence (including any required additional preparation/travel time). The student is also expected to remind the faculty member in advance of the missed class, and to make arrangements in advance (with the faculty member) to make up any missed work or in-class material within a reasonable amount of time.

See: http://www.du.edu/studentlife/religiouslife/DU_religious_accommodations_policy.html

ACADEMIC DISHONESTY & STUDENT SUPPORT

While I advocate collaborative learning and teamwork, I also firmly believe that each individual should maintain the highest ethical standards in all of life's endeavors. As such, I support and will strictly enforce the Honor Code of the University of Denver. See links for specific links below:

Pioneer Pledge: <http://www.du.edu/studentlife/ccs/pledge.html>

Honor Code Statement: http://www.du.edu/studentlife/ccs/honor_code_2011-2012.pdf

I also understand that every student has unique personal and educational needs. I will do my best to help you learn or appropriately facilitate your ability to work through personal issues. Please see the Office of Student Life (<http://www.du.edu/studentlife/ccs/index.html>), including the Pioneer Care program (<http://www.du.edu/studentlife/care/>), for more detailed resources.

To protect privacy and intellectual property rights, course videos, student discussions, and other course materials (including questions, answers, solutions, or work associated with course material) may be used solely for the purposes of individual or group study with other students enrolled in the class this quarter. They may not be reproduced or shared in any way (including electronically or by posting in any web environment) with those not enrolled in the course, except with expressed written permission. This list of disallowed behavior includes posting anything to online cheating sites like Chegg.com. Students who violate this policy will be reported to The Office of Student Rights & Responsibilities and may be subject both to legal sanctions for violations of copyright law and disciplinary action under Student Rights & Responsibilities Policies.

TENTATIVE SCHEDULE

Week #	Lecture #	Date	Week-day	Topic	Reading Section (9th Edition)	HW Due Date (Mon 7 am)	SB Due Date (Fri 7 am)	Other Assignments
1	1	Jan 3	M	Course Intro; Review enthalpy, ΔH	6.4, 6.6			
	2	Jan 5	W	Entropy, ΔS , and 2nd Law (Intro)	20.1 - 20.2			
	R1	Jan 6	Th	<i>Recitation</i>	-			
	3	Jan 7	F	ΔS and the 2nd Law (Math)	20.2 - 20.3		SB 1 (Sat)	Math quiz
2	4	Jan 10	M	2nd Law and Gibb's Free Energy, ΔG	20.3	HW1		
	5	Jan 12	W	Intro to equilibrium; K and manipulations	17.1 - 17.2			
	R2	Jan 13	Th	<i>Recitation</i>	-			
	6	Jan 14	F	Reaction quotient, Q; Kc and Kp	17.3 - 17.4		SB2	
3	-	Jan 17	M	<i>Martin Luther King Jr. Holiday (No Class)</i>	-			
	7	Jan 19	W	Equilibrium - K, Q, and ΔG	20.4	HW2 (Tues)		
	R3	Jan 20	Th	<i>Recitation</i>	-			
	-	Jan 21	F	Quiz #1	-		SB3	
4	8	Jan 24	M	Disturbing equilibrium (Le Chat)	17.6	HW 3		
	9	Jan 26	W	Equilibrium - Solving equilibrium problems, ICE tables	17.5			
	R4	Jan 27	Th	<i>Recitation</i>	-			
	10	Jan 28	F	Equilibrium - Solving equilibrium problems, ICE tables	17.5		SB4	
5	11	Jan 31	M	Acid-base, pH definition; Water autoprotolysis	18.1 - 18.2	HW 4		
	12	Feb 2	W	Acid-base - Ka, Kb, Bronsted acids, Conjugate acids/bases	18.3			
	R5	Feb 3	Th	<i>Recitation</i>	-			
	-	Feb 4	F	Quiz #2	-		SB5	
6	13	Feb 7	M	Acid-base - Quantitative problems	18.4	HW 5		
	14	Feb 9	W	Weak base equilibria and acid/base properties	18.5 - 18.8			
	R6	Feb 10	Th	<i>Recitation</i>	-			
	15	Feb 11	F	Buffers I	19.1		SB6	
7	16	Feb 14	M	Buffers II	19.1	HW 6		
	17	Feb 16	W	Titrations I	19.2			
	R7	Feb 17	Th	<i>Recitation</i>	-			
	-	Feb 18	F	Quiz #3	-		SB7	
8	18	Feb 21	M	Titrations II	19.2	HW 7		
	19	Feb 23	W	Equilibria of sparing soluble salts (Ksp)	19.3			
	R8	Feb 24	Th	<i>Recitation</i>	-			
	20	Feb 25	F	Equilibria of complexions (Kf)	19.4		SB8	
9	21	Feb 28	M	Kinetics - Intro, reaction rate	16.1 - 16.2	HW 8		
	22	Mar 2	W	Kinetics - Rate law	16.3			
	R9	Mar 3	Th	<i>Recitation</i>	-			
	-	Mar 4	F	Quiz #4	-		SB9	
10	23	Mar 7	M	Kinetics - Integrated rate law	16.4	HW 9		
	24	Mar 9	W	Kinetics - Activation energy / temperature / Arrhenius	16.5			
	R10	Mar 10	Th	<i>Recitation</i>	-			
	25	Mar 11	F	Kinetics - Mechanisms	16.6 - 16.7		SB10	
11	26	Mar 14	F	Course Review	-	HW 10		
	F	Mar 15	Tu	FINAL EXAM	-			

Important Notes:

- Schedule is approximate. Dates of challenge quizzes may be changed, but *with* appropriate notice.