General Chemistry

Winter 2022 **Chem 1020-04**

Professor- Dr. Debbie Gale Mitchell (please call me "Dr. Mitchell")

Email- debbie.mitchell@du.edu

Zoom *room*: https://udenver.zoom.us/my/**heydebigale** (Links to an external site.)

Discord server: https://discord.gg/TsE7E2jCmu

 Twitter: @heydebigale (Links to an external site.)

Official Lecture Time: T/R noon-1:50 PM in Sturm 251

Office Hours (through Science and Engineering Center):

Monday from 11:30 AM-12:30 PM in SEC
Wednesday from 9-11 AM in the SEC

Wednesday from 3:30--4:30 in my Zoom room (see above)

Thursday from 6:30--7:30 in my zoom room. (see above)

COURSE OBJECTIVES

After general chemistry II you should be able to do the following:

1.) Describe & apply essential concepts in the following areas:

a.) Thermodynamics: Describe & apply the 1^{st} , 2^{nd}, and 3^{rd} laws of thermodynamics. Students will be able to calculate enthalpy/entropy/Gibb's free energy and relate these calculations to laboratory predictions and measurements

b.) 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.

c.) 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.

d.) 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.

e.) 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.

f.) 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.

2.) Develop a growth mindset: Demonstrates significant effort. Acknowledge personal growth in various contexts and applications in chemistry

REQUIRED COURSE ITEMS

Text: Connect Chemistry with LearnSmart and eBook - *Chemistry: The Molecular Nature of Matter and*

Change, 9th Edition, Silberberg, McGraw-Hill Publishers ****I recommend you purchase directly from McGraw-Hill.**** No paper text is required but you can buy a used copy of the 5th or 6th editions of the Silberberg text if you wish (<u>The Connect Plus account is still required</u>). Used copies cost about $15 – 50 on Amazon.

Calculator: An inexpensive calculator is required. It should have the capabilities for square roots, logarithms, and exponential (scientific) notation operations. The calculator will be used for homework, quizzes, and final.

COURSE COMPONENTS:

Lectures (Online): A lecture schedule is below. For this course we will often be watching online lectures prior to our scheduled class meetings. It is your responsibility to watch the lectures before class. You will also be taking notes while watching the online lectures to help absorb the material (see Summary Notes below). You will also be required to submit a weekly reflection along with the notetaking assignment. Our scheduled class time will be dedicated time to discussion & going through problems associated with material in online lecture.

Readings: Assigned reading should be completed prior to lecture. Scheduled reading is listed in the schedule below. As mentioned above, you will be asked to reflect on your reading through a weekly journal assignment.

Summary Notes: You will be turning in summary notes for each week covering the reading/online lectures that you are watching on your own time (individual space). For each week, you will be starting your notes by summarizing your prior knowledge on a particular topic. Key Terms will be given that must be highlighted in your summary notes. For certain weeks, I may ask for diagrams and drawings. You will turn in these notes on Canvas.

Group work: This quarter, you will be working in small groups 1-2x/week. I will be splitting your class into 12 groups with 5-6 students in each group. You can sign up for your group (based on your where you sit in class) in canvas.

Group Project: This quarter we are studying the kinetics (speed) and thermodynamics (favorability) of a reaction. In this group project, you will have the opportunity to deeply examine one chemical reaction with your group. The details of this assignment are posted on canvas.

Weekly Reflections: Each week you will complete a weekly reflection after turning in your Summary Notes. The weekly reflection is to help me keep track of what all of you are having questions on. What are you not understanding, etc.

Kahoot/In-class Participation: This quarter we will be using Kahoot (kahoot.com) as a polling software. Kahoot is a FREE app that you can download to your phone or you can use from a laptop.

Buffer Points: You will have the opportunity to collect Buffer points this quarter by sharing summary notes, sharing class notes, or participating in class & small group sessions. Buffer points will be used if you are boarderline (or "on the bubble") between two grades (A-/B+) to help bump you up to that higher grade. These points are NOT extra credit.

Quizzes & Final:

1. There will be 4 (bi-weekly) quizzes worth 50 points each administered through Canvas (200 points total).
2. There will be one optional cumulative final at the end of week 10. The cumulative final will be worth xx points.
3. **d) All quizzes will be comprehensive encompassing lecture materials, assignments, and in-class assignments. The exams are designed to test your ability to apply the concepts covered in the lecture.**

Grade Breakdown:

Homework	100 points
Notes/Reflection	100 points
Group Work	100 points
Quizzes	200 points
Final Exam	**TBD**
TOTAL	**500 points**

Grades will be based on the following approximate grade scale:

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

Students who earn at least 94% of the possible points are guaranteed an A in this class; however, it may not be necessary to earn 94% to receive an A since this scale may be modified downward at the discretion of the instructor. Scores will be recorded on Canvas as they are graded. Each student should check Canvas frequently to make sure scores are recorded correctly.

RESOURCES/ADVICE

It is important to acknowledge the difficult challenge that you are currently facing in the 2020/2021 academic year. Learning during a pandemic is incredibly challenging and I want to honor and acknowledge that. Because of the challenges we are currently facing, all the deadlines in this class will be soft. Please try and follow the deadlines, but there will be no penalty if you need to turn work in late. If you need any additional support, please do not hesitate to contact me: debbie.mitchell@du.edu. I will do my best to work with each of you.

Help

Students who need help in this class have several options:

- The Science and Engineering Learning Center, typically located on the first floor of the library, but currently located on Zoom, is a great resource! TAs are available throughout the week to answer questions on both lecture and lab material.
- Take advantage of office hours! If you cannot make office hours, please email me to set up an appointment.
- Peers (Study Groups): Take opportunities to help those around you and to ask for help. You can learn a lot you're your fellow classmates.

Science and Engineering Center: 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. We offer support for both lecture and laboratory courses for chemistry, physics, and engineering courses and lecture only for computer science and biology. Our goal is to help students grow as problem solvers by assisting with homework sets, lab reports, and preparing for exams. This center is open to all DU students. All services are free. Typically, the SEC is located in the north-west corner of the first floor of the Anderson Academic Commons (west of the writing center). However, due to COVID-19, the SEC will be operated through Zoom. See http://portfolio.du.edu/sec for a complete schedule.

Academic Honesty in General Chemistry:

- To protect privacy and intellectual property rights, course videos, student discussions, and other course materials may be used solely for the purposes of individual or group study with other students enrolled in the class in that quarter. They may not be reproduced or shared in any way (including electronically or posting in any web environment) with those not in the class in that quarter, except with explicit permission. Students who violate this policy will be reported to The Office of Student Rights & Responsibilities and may be subject to both legal sanctions for violations of copyright law and disciplinary action under Student Rights & Responsibilities Policies.
- Can I work with someone on that assignment? Please use the following table to help you know which assignments you can collaborate, and which assignments you should be doing independently:

Activity	**Is collaboration appropriate?**
Homework	Yes! You are encouraged to discuss the homework with others in your class. However, the homework you submit should represent your own work.
Notes/Reflection	Yes! You are encouraged to discuss the content & notes with other students. However, the notes/reflections you submit should represent your own work.
Weekly Group Work	Yes! You will be working on these activities collaboratively & will have just one submission from the entire group for each activity/assignment.
Group Project (x1)	Yes! You will be working on this project collaboratively & will submit one assignment from the whole group.
Quizzes (x4)	No, these quizzes should be entirely your own work. It is not appropriate to discuss the questions with ANYONE inside or outside the class. Students who post to any web environment (such as Chegg/Course Hero)will be reported to The Office of Students Rights & Responsibilities. You will also receive an automatic zero on the assignment.

Final Exam (x1)	The final exam should be entirely your own work. It is not appropriate to discuss the questions with ANYONE inside or outside the class. Students who post to any web environment (such as Chegg/Course Hero)will be reported to The Office of Students Rights & Responsibilities. You will also receive an automatic zero on the assignment.

Tenative **LECTURE SCHEDULE**

Lecture	TOPIC	READING	Problem Sets
WEEK 1 – REVIEW & INTRO TO SPONTANEOUS CHANGE			
1	Course Introduction, Enthalpy	Review Ch. 6	
2	Spontaneous Change/Entropy	20.1-20.2	Problem Set 1
WEEK 2 – ENTROPY & GIBB'S FREE ENERGY			
3	Entropy & Free Energy	20.2-20.3	
4	Free Energy & Equilibria Intro	20.4 & 17.1	Problem Set 2
WEEK 3 – INTRO TO EQUILIBRIA			
5	Equilibrium Constants/Rxn Quotient	17.2-17.4	
6	ICE tables & Le'Chatlier's Principle	17.5-17.6	Problem Set 3
WEEK 4 – ACID-BASE EQUILIBRIA			
7	Acid-Base Equilibria, Intro to Ka	18.1-18.4	
8	Weak Acid Equilibria	18.2-18.4	Problem Set 4
WEEK 5 – ACID-BASE EQUILIBRIA CONTINUED			
9	Weak Base Equilibria, properties of A&B	18.5-18.8	
10	Buffer Solutions, HH Equation	19.1	Problem Set 5
WEEK 6 – BUFFERS AND TITRATION CURVES			

11	HH Equation, Principle Species	19.1 & Supplementary	
12	Titrations, continued	19.2	Problem Set 6
WEEK 7 – SOLUBILITY & pH			
13	Solubility Equilibria, Ksp	19.3	
14	Complex Ion Equilibria, Kf	19.4	Problem Set 7
WEEK 8 – KINETICS			
15	Intro to Kinetics & Reaction Rates	16.1-16.2	
16	Rate Laws	16.3-16.4	Problem Set 8
WEEK 9 – KINETICS			
17	Theories of Chemical Kinetics	16.5	
18	Reaction Mechanisms	16.6	Problem Set 9
WEEK 10 – KINETICS			
19	Catalysis	16.7	
20	Final Review		Problem Set 10