General Chemistry CHEM 1010 - 4 [Fall 2019]

Instructor Dr. Michael Swanson
Office: TBD
Contact info: phone: weekdays (303)724-6355; email: mike.swanson@du.edu
Class Lectures: TR 8:00 – 9:50; Sturm 151
Office Hours: TR 7:30-8:00, 9:50-10:30 (by appointment)

There are only 98 naturally occurring elements in the Universe yet they are responsible for the seemingly infinite diversity we see around us, from the largest super nova to the smallest virus. The Earth itself is comprised primarily of 7 elements (oxygen, silicon, magnesium, sulfur, nickel, calcium and aluminum) which account for approximately 99% of its mass. Part of the remaining 1% of the Earths mass comes from carbon, hydrogen, nitrogen and phosphorus, the elements of life. All elements contain the same three subatomic particles; the proton, neutron and the electron. Protons and neutrons make up the nucleus of atoms and are responsible for 99.9% of an atom's mass but only about 1/100,000th of the volume. MATTER IS COMPRISED PRIMARILY OF EMPTY SPACE! How do three subatomic particles come together to form 98 unique elements? How do these elements interact to form molecules? How do molecules interact with other molecules and undergo change? What are the driving forces behind these interactions? These are just a few questions we hope to answer in this course. Welcome to General Chemistry!

COURSE OBJECTIVES
After General Chemistry, you should be able to do the following:

- **Relate atomic spectra to electronic transitions**
- **Predict trends in atomic properties**
- **Predict molecular shapes and polarity**
- **Apply molecular bonding theories**
- **Complete stoichiometry calculations**
- **Balance complex chemical equations**
- **Calculate heats of reaction for chemical reactions**

REQUIRED COURSE ITEMS

Textbook: Connect Chemistry with LearnSmart and eBook - *Chemistry: The Molecular Nature of Matter and Change, 8th Edition, Silberberg, McGraw-Hill Publishers* - $133 (2 Years) (*ISBN-13 9781259916175*).
http://www.mheducation.com/highered/product/M1259631753.html#
You will use Connect for all 3 classes in the general chemistry sequence.
****I recommend you purchase directly from McGraw-Hill.**
No paper text is required but you can buy a used copy of the 5th, 6th or 7th editions of the Silberberg text if you wish (The Connect Plus account is still required). Used copies cost about $15 – 50 on Amazon.

Online homework: You will be required to participate in LearnSmart modules and submit problem sets via an online homework system called Connect. Instructions for enrolling in Connect are given on Canvas.

Calculator: An inexpensive calculator that has the capabilities for square roots, logarithms, and (exponential) scientific notation operations.

READINGS AND LEARN SMART ASSIGNMENTS. Assigned reading should be completed prior to class. The adaptive learning software LearnSmart will be used to reinforce the concepts from the book and online lectures. ***There will be a LearnSmart assignment due before every lecture*** (links on Canvas and Connect). The length and content of each assignment will vary between students depending on their understanding of the material. The more closely you read the material, the less time you are likely to spend on these assignments. LearnSmart assignments (6.25 points each) will not be graded based on right/wrong answers but on completion. Students are strongly encouraged to spend extra time using the features in the LearnSmart interface to study. **There is no way to extend the deadline for these assignments so no late work can be accepted.**

Connect course address: http://connect.mheducation.com/class/chem1010_section4_du_2019

CLASS MEETINGS. Important concepts from readings will be highlighted during lectures. Periodically throughout lecture, questions will be posed and you will be given time to work through and discuss them with your fellow classmates. Step-by-step solutions will then be presented to the class. Attendance is not mandatory but encouraged. ***The Tuesday lectures before midterm exams will be "flipped".*** This means that a recorded lecture will be posted online. You will be required to watch these recorded lectures before the scheduled lecture time. Class time will be spent answering questions about the lecture, working through the problem set for those weeks and reviewing for the upcoming exam.

PROBLEM SETS. Practicing problems is very helpful in the mastery of chemical concepts. Thus, problem sets will be assigned throughout the quarter using the on-line Connect system. These homework problems will be worth a total of 100 points and will be ***due weekly*** (by 10 pm Saturday nights, and 10 pm Tuesday nights during the week of an exam). ***Late problem sets will be deducted 20% per day.***

EXAMS. There will be three (3) one-hour exams given during the quarter and a two-hour, cumulative final exam. Dates for these exams are posted below on the lecture schedule. **NO MAKE-UP EXAMS WILL BE ACCEPTED**. There is one exception to this policy. If you will be out of town for a University sanctioned function (e.g., athletic team or music group), you are responsible for making arrangements with Dr. Swanson at least one week in advance to complete the exam prior to the scheduled date. If you miss an exam, then your final exam will be counted twice to replace the missed exam.
If your grade on your final exam is higher than one of your hour exams, your final exam will be counted twice to replace your lowest hour exam grade.

GRADES. Final grades will be determined according to performance on exams, problem sets and completion of LearnSmart modules. There will be a maximum of 600 points for the course:

Component	Points
Hour Exams (100 points each)	300
Final Exam	100
LearnSmart Modules (5 points each)	100
Homework (10 points each)	100
Total Points	**600**

SUCCEEDING IN CHEMISTRY. Here are few helpful hints on how to succeed in this class:

Do your best on the exams!
How?

1. Read the material in the text book BEFORE class. Don't get behind.
2. Follow check list of assignments (Canvas). Complete every assignment possible.
3. Attend class regularly. Take notes on content learned in lecture (Problems worked).
4. Be ready to ask questions… and ask them! Get help from course instructor!
5. Study with other students in the class.

SEEKING HELP. If you need help in the class, first be sure that you are following steps 1-3 listed above. If you still require assistance there are several places for you to go:

- ***The instructor***: office hours are available before and after each class for one-on-one consultation. Contact the instructor via email or phone.
- ***The Science and Engineering Learning center***: TAs are available throughout the week to answer questions on both lecture and lab material (See Below).
- ***Peers (Study Groups)***: Take opportunities to help those around you and to ask them for help. You can learn a great deal from your fellow classmates.
- ***Tutors***: The Chemistry Department office has a list of graduate student tutors.

Science and Engineering Center: Need extra help? The Science and Engineering 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. The Science and Engineering 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. Located in the north-west corner of the first floor of the Anderson Academic Commons (west of the writing center). See http://portfolio.du.edu/sec for a complete schedule. Please also follow on Twitter for the most up-to-date announcements: **@SELCatDU**

LECTURE AND TESTING ACCOMODATIONS. Every effort will be made, in complete confidence, to accommodate students diagnosed with a learning disability. Any student requiring these accommodations should inform Dr. Swanson the first week of class. For further information, please see DU's Disability Services' website at http://www.du.edu/disability/dsp/index.html.

ACADEMIC DISHONESTY. Collaborative learning and teamwork are very important parts of science but cheating of any kind will not be tolerated. Each student is required to provide their own work on homework and exams. **Copying an exam or homework (*as well as any behavior that could be interpreted as copying*) will result in no credit being given on the assignment or exam.** Repeated offences will result in failure of the course and possible expulsion from the University. Please refer to the University's honor code: http://www.du.edu/ccs/honorcode.html.

LECTURE SCHEDULE (problem set due dates in red, flipped lectures in blue)

DATE	TOPIC	READING	HOMEWORK
WEEK 1 – MATTER AND ATOMIC STRUCTURE			
Sep 10	Course Introduction/History of Matter	1.2 – 1.5**	Access Connect
12	Atomic Structure	2.1 – 2.6	
14			Problem Set 1
WEEK 2 - QUANTUM-MECHANICAL MODEL OF THE ATOM			
17	Nature of Light	7.1 - 7.2	
19	Electrons as Waves and the Quantum-Mechanical Atom	7.3 - 7.4, 8.1	
21			Problem Set 2
WEEK 3 – PERIODICITY OF THE ELEMENTS			
24	Periodic Trends and Chemical Reactivity (flipped lecture)	8.2 – 8.4	
24*			Problem Set 3
26	**HOUR EXAM I** (Covers Sep. 10 - 24)		
WEEK 4 – CHEMICAL BONDING AND ELECTRONEGATIVITY			
Oct 1	Lewis Symbols and Bonding	9.1 - 9.3, 2.8	
3	Bond Polarity and Lewis Structures	9.5, 10.1	
5			Problem Set 4
WEEK 5 - LEWIS STRUCTURES AND MOLECULAR SHAPE			
8	VSEPR Theory and Molecular Shape	10.2, 10.3, 12.3‡	
10	Valence Bond Theory and Hybrid Orbitals	11.1	
12			Problem Set 5
WEEK 6 - COVALENT BONDING THEORIES			
15	Orbital Overlap and MO Theory (flipped lecture)	11.2 – 11.3	
15*			Problem Set 6
17	**HOUR EXAM II** (Covers Oct 1 – Oct 15)		

WEEK 7 – Introduction to Chemical Reactions, STOICHIOMETRY AND AQUEOUS CHEMISTRY

22	Chemical Problem Solving	3.1, 3.3, 3.4**	
24	Aqueous Solutions and ppt Reactions	12.5ǂ, 4.1-4.3	
26			Problem Set 7

WEEK 8 – ACID-BASE AND OXIDATION-REDUCTION (REDOX) REACTIONS

29	Acid-Base Chemistry	4.4, 2.8	
31	Redox Reactions	4.5 – 4.6	
Nov 2			Problem Set 8

WEEK 9 – GASES

5	The Ideal Gas Law (flipped lecture)	5.1 – 5.4	
5*			Problem Set 9
7	**HOUR EXAM III** (Covers Oct 22 - Nov 5)		

WEEK 10 – THERMOCHEMISTRY

12	Enthalpy and Calorimetry	6.1 – 6.3	
14	Hess's Law and Heats of Reaction	6.4 – 6.6	
16			Problem Set 10

Nov 21 **FINAL EXAM: 8AM to 9:50AM** (Cumulative)

* Problem set due Thursdays of exam weeks.
** Review Material
ǂ Chapter 12.3 and 12.5, only responsible for what is in lecture