CHEM 051: *Exploring Chemistry I*
Fall 2020

Instructor

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Office Location

Innovation Hall
Room E356

Office Hours

By appointment on MS Teams

Class Meeting Times (Thurs)
Sectns B & C: 1:15-5:15 pm

Class Lab Room
Discovery Hall
Room W213 (C)
Room W211 (B)

Teaching Assistants
Alexandria Alveshere
Diego Javier-Jimenez

Course Overview

Chemistry is an experimental science, so what better way to provide the foundation for your current and future studies than to discover them in the laboratory? In this course, we will explore some of the fundamental concepts underlying all of Chemistry by learning how to do science: ask questions, postulate hypotheses, design and perform experiments to test those hypotheses, share data, and try forge a little bit of order from the chaos of the natural world.

This is a lab-based course that will introduce you to new experimental methods and teach you basic skills that will serve you as you take more advanced coursework in Chemistry and other natural science disciplines. We will also spend time working together before and after our work in the lab, exploring how to move from questions borne of our natural curiosity, to designing experiments, to compiling and evaluating the resulting data. Lastly, we will address ways in which we communicate the results of our work so that others might also learn more about the behavior and properties of chemical substances.

Required Text/Course Materials

There are no required texts for this course. Handouts for each laboratory exercise will be provided, as needed, and will include literature references as necessary.

This is, however, a laboratory course, so you will need a lab notebook and safety glasses (the same ones you will need and use in CHEM 047 - Organic Chemistry for Majors I - will be fine to use). I also recommend that you purchase an inexpensive scientific calculator to use in the lab and in other classes where you are not able to use a graphing calculator or other personal electronic device on exams. The UVM Bookstore sells a nice one for $7.99 (Yikes! I paid more than $125 for mine when I first started college . . . but then that was in the Precambrian Era . . .)

Course Learning Objectives

Together with the CHEM 047 co-requisite course, you will obtain a foundational understanding of the major ideas in chemistry, often demonstrated with organic compounds. This course serves to both support the work done in CHEM 047 as well as to explore other chemical concepts and methodologies fundamental to all areas of chemistry.

We will use a discovery or guided-inquiry structure in this course so that, in addition to the subject-based content, you will be exposed to and directed to solve chemical problems in the laboratory using the scientific method. It is our hope that the critical thinking and problem-solving skills you will learn and employ in learning chemistry this year will serve you as you explore disciplinary areas other than chemistry and will provide you with a template for exploration throughout your life.

Some specific learning objectives of this course (across both semesters) include understanding:

- the scientific method as a process for problem solving and learning chemical principles
- covalent and ionic bonding
- bond polarity and dipole moment
- intermolecular forces
- chemical equilibrium
- acids and bases
- pH, pK_a, pK_b
- reaction kinetics and mechanisms
- reaction energetics (thermochemistry)
- spectroscopic identification of organic compounds

(Note: this is not an exhaustive list and is subject to change based on the needs of the students in the class.)

But, most importantly, this is not a course in which the destination is most important – rather, we will be more concerned with process, *how* we come to understand the fundamentals of chemistry. I am less concerned that you know "the answer" and more concerned that you understand how to figure out what "the answer" is!

COVID-19 Considerations

In order to both ensure the safety of everyone in this class as well as meet the learning objectives of this laboratory course, we've made a number of changes to the course structure and operation this semester. Our laboratory rooms have been carefully marked so as to maintain physical distancing both at the lab benches as well as near shared facilities (e.g., balances, fume hoods, sinks, etc.). Reducing lab densities requires that only *half* of the usual lab capacities be used and, whereas students would typically work in pairs, this semester each student will work by themselves. This means that, in any given week, only *half* of the students enrolled in the class will be in the lab performing an experiment in-person, while the other half of the students in the class will be working on a simulation experiment online. While we would prefer that *all experiments* be performed in the lab, we have carefully selected experiments in which laboratory skills are learned for the in-class labs, leaving more concept-focused experiments for online simulations. This will not change the focus and philosophy of the course: for both sets of experiments, you will be encouraged to explore fundamental chemical questions using the scientific method and by collaborating and sharing data with your classmates.

While we have, in the past, spent the full 4-hour lab period in the laboratory for some experiments, we will be shifting to online all activities that do not absolutely need to be done in-person in the laboratory space. This will focus our time in the lab room, minimizing the potential of exposure to Covid-19.

This fall, more than ever, we need to make sure that our class behaves as a caring and safe community - we can only operate safely in the lab if we all are willing to work to ensure the health of everyone in our "community." In addition to the usual safety precautions taken while working in a chemistry lab in which hazardous substances are handled (e.g., safety goggles, gloves, etc.), we will also provide and require that you wear a disposable medical procedure mask while in the lab. Keeping our community safe also requires that we share information regarding our own health as it relates to working safely together in lab – so, prior to entering the lab, you will be asked to complete a check-in form (not unlike the daily check-in you make as part of the Green and Gold Promise with questions similar to those asked by some businesses prior to admission to their facilities). If you are not feeling well, have been exposed to someone who has tested positive for Covid-19 (or have, yourself, tested positive), travelled outside of the state within the past 14 days, etc. you should not be working in the lab. I have committed to weekly testing – just as you have – and should I not feel well or test positive or if I have been exposed to someone who has tested positive, I will not be with you in the lab until I can do so safely.

Before our first laboratory experiment, you will be provided with information regarding safety in the chemistry laboratory, including specific precautions we have implemented this semester for minimizing the potential for exposure to

Covid-19. I am confident that, with attention to all of these safety protocols, we can have a safe and meaningful semester in and outside of the lab!

Grading

Your course grade will be determined by your point total at the end of the semester. There are 100 possible points that can be earned, according to the following distribution categories:

- *Attendance: 20% (20 points).* Each of the ten lab class sessions (this includes in-class and online experiments) is worth 2 points, for a total of 20 possible points for the semester. However, since this is a laboratory course, you are expected to be in lab/online each week for each experiment/exercise. **It is not possible to pass this course with more than two absences (excused or unexcused), but should you be unable to attend lab or do the work for the lab due to illness this semester, please be assured that we will work with you to make appropriate accommodations for you to complete the required number of experiments/exercises.**

- *Lab Notebook: 20% (20 points).* You will be expected to keep a notebook documenting all of your preparation for and work in the lab. Your lab notebook "carbonless copies" will be submitted after each lab class session and assessed relative to the expectations and good laboratory practice presented to you in class. Each of these will be worth 2 points (on average), for a total of 20 possible points for the semester. While many of our labs will not require any advance preparation, for those that do require it, lack of evidence of preparedness for a laboratory experiment/exercise could result in your expulsion from the lab for the day, if it is determined that you are not prepared for working safely in the laboratory.

- *Participation: 20% (20 points).* We will rely heavily on working collaboratively in this course and your behavior in the laboratory will be assessed relative to your efforts to support the learning objectives of the class as a whole. No single person in this course will be able to perform all of the experimental measurements necessary to test the hypotheses posed and to answer the questions raised – collaboration and sharing of data and observations are essential to the success of the entire class. At the end of the semester, each student will be awarded up to 20 points based on their participation in the lab across the entire semester.

- *Lab Reflections/Reports: 30% (30 points).* While there will not be formal lab reports you will need to write for this course, after each lab experience there will be some kind of *prompt* to which you will be expected to think about and turn in a written reflection or (very brief) report prior to the next lab period. Typically, these will be no more than one page and will be assigned by Saturday of each week and due by the start of lab each week. There will be 10 of these assignments and they will be graded on a scale of 0 to 3 points.

- *ACS Exam: 10% (10 points):* During the 1st week of the semester, you will be asked to take Part One of the General Chemistry standardized, multiple-choice exam created by the American Chemical Society (ACS). You do not need to study for this, as the purpose of this exam is to provide a baseline for assessment – you will, however, need to bring a simple scientific non-graphing calculator (no other electronic devices will be allowed). Ten points will be awarded for taking the exam - points awarded are not based on your score on the exams, but it is expected that you do your best and complete the exam during the lab period (for which you will receive the full 10 points).

UVM Policies

Student Learning Accommodations: In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact the Student Accessibility Services (SAS) office on campus. SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter. All students are strongly encouraged to meet with their faculty to

discuss the accommodations they plan to use in each course. A student's accommodation letter lists those accommodations that will not be implemented until the student meets with their faculty to create a plan.

Student Accessibility Services
A170 Living/Learning Center
802-656-7753
access@uvm.edu
http://www.uvm.edu/access

Policy on Disability Certification and Student Support:
http://www.uvm.edu/policies/student/disability.pdf

Religious Holiday Policy Statement: *Students have the right to practice the religion of their choice. If you need to miss class to observe a religious holiday, please submit the dates of your absence to me in writing by the end of the second full week of classes. You will be permitted to make up work within a mutually agreed-upon time.*

Academic Integrity: This policy addresses plagiarism, fabrication, collusion, and cheating.

http://www.uvm.edu/policies/student/acadintegrity.pdf

Code of Student Rights and Responsibilities:
http://www.uvm.edu/policies/student/studentcode.pdf

Center for Health and Well-Being: http://www.uvm.edu/~chwb/

Counseling and Psychiatry Services (CAPS): http://www.uvm.edu/~chwb/psych/

If you are concerned about a UVM community member or are concerned about a specific event, we encourage you to contact the Dean of Students Office (802-656-3380).

If you would like to remain anonymous, you can report your concerns online by visiting the Dean of Students website at: https://www.uvm.edu/deanofstudents/student_advocacy/care_form

CHEM 051

Exploring Chemistry 1

Tentative **Lab Schedule**

Fall 2020

		Topic/Activities	
Week	**Dates**	**Section B**	**Section C**
1	3-Sep	Online Intro Session (MS Teams)	
2	10-Sep	**INLAB:** Quantitative Measurements and Data Analysis	***ONLINE:*** Inorganic Reaction Chemistry
3	17-Sep	***ONLINE:*** Inorganic Reaction Chemistry	**INLAB:** Quantitative Measurements and Data Analysis
4	**24-Sep**	***CHEM 047 EXAM WEEK*** *- NO CHEM 051 LAB*	
5	1-Oct	**INLAB:** Logic/Qual Analysis	***ONLINE:*** Atomic Structure
6	8-Oct	***ONLINE:*** Atomic Structure	**INLAB:** Logic/Qual Analysis
7	15-Oct	**INLAB:** Synthesis and Spectroscopy of Metal-Ligand Complexes	***ONLINE:*** Electronic Structure of Metal-Ligand Complexes
8	**22-Oct**	***CHEM 047 EXAM WEEK*** *- NO CHEM 051 LAB*	
9	29-Oct	***ONLINE:*** Electronic Structure of Metal-Ligand Complexes	**INLAB**: Synthesis and Spectroscopy of Metal-Ligand Complexes
10	5-Nov	**INLAB:** Effects of pH on Electronic Structure	***ONLINE:*** Stoichiometry of Metal-Ligand Complexes
11	12-Nov	***ONLINE:*** Stoichiometry of Metal-Ligand Complexes	**INLAB:** Effects of pH on Electronic Structure
12	**19-Nov**	***CHEM 047 EXAM WEEK*** *- NO CHEM 051 LAB*	
13	26-Nov	***Thanksgiving!*** *- NO CHEM 051 LAB*	
14	3-Dec	Online Closing Class (MS Teams)	