



## Exploring Chemistry

### CHEM 051

## Instructor Info



David Punihaole, PhD



Office Hrs: Wed 6:00 - 17:00



Innovation Hall 352 or by Appt.



David.Punihaole@uvm.edu

## Course Info



Co-req: CHEM 047



Thurs



08:30-12:30 or 3:15 - 17:15



DISCOVERY W211 or W213

## TA Info



Rusul Mustafa



Office Hrs: Fri 3:00 - 14:00



Discovery W203 or by Appt.



Rusul.Mustafa@uvm.edu



Emily Verhaeg



Office Hrs: Tues 08:00 - 09:00



Discovery W203 or by Appt.



Emily.Verhaeg@uvm.edu

## 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, share data, collaborate, and try to 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 your 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 Course Materials

### Required Texts

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.

### Required Materials

This is 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 1 - 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.

## 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, including analytical, physical, and inorganic 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
- how to critically analyze scientific literature
- how to write like a scientist
- covalent and ionic bonding
- bond polarity and dipole moment
- intermolecular forces
- chemical equilibrium
- acids and bases
- pH,  $K_a$ ,  $K_b$
- 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.)

## Grading Scheme

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:

20%	Attendance
30%	Lab Notebook
10%	Participation
40%	Lab Reflections

Grades will follow the standard scale: A = 93-100%; A- = 90-92%; B+ = 87-89%; B = 83-86%; B- = 80-82%; C+ = 77-79%; C = 73-76%; C- = 70-72%; D+ = 67-69%; D = 63-66%; D- = 60-62%; F = < 60%. Grades will be curved at the discretion of the professor.

Please note:

- Attendance: Since this is a laboratory course, you are expected to be in lab each week for each experiment/exercise. There are no makeup lab sessions. Please note: it is not possible to pass this course with more than two absences (excused or unexcused).
- Lab Notebook: 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 collected after each lab class session and assessed relative to the expectations and good laboratory practice presented to you in class. 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: 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.
- Lab Reflections: 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 two pages and will be assigned by Saturday of each week and due by the start of lab each week.

## Course Policies

### General Attendance, Participation Policies, and Expectations

This course is worth 1-credit. As a result, you are expected to commit, on average, about 3 hours per week to work assignments outside of the in-class period. Attendance/participation in this course is expected for you to succeed. The UVM attendance policy outlines expectations for attendance. Students are expected to complete homework and read class notes (which will be posted prior to lecture) before class. Science has never and is not done in isolation. A major part of this course will depend upon class discussion, working in teams, or participating in other group activities. Students are expected to be team players and to maintain a respectful learning environment so that everyone is heard. Racist, sexist, or any other bigoted language will not be tolerated and are grounds for being asked to leave the class.

### Excused Absence Policies

- Religious Holidays: 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 frame. <https://www.uvm.edu/registrar/religious-holidays>
- Inter-collegiate Athletics: Members of UVM varsity and junior varsity teams are responsible for documenting in writing any conflicts between their planned athletic schedule and the class schedule by the end of the second full week of classes. You will be permitted to make up work within a mutually agreed-upon time frame.
- Medical and Emergency Absences: Absences due to sickness, as well as medical and family emergencies, should be brought to my attention as soon as possible. You will be permitted to make up work within a mutually agreed-upon time frame.
- Other Absences: Absences due to extracurricular or other activities not specified above should be brought to my attention as soon as possible so that we can work out an arrangement to make up work.

## COVID-specific Policies

The University of Vermont reserves the right to make changes in the course offerings (<http://catalogue.uvm.edu/>), mode of delivery, degree requirements, charges, regulations, and procedures contained herein as educational, financial, and health, safety, and welfare considerations require, or as necessary to be compliant with governmental, accreditation, or public health directives.

Due to COVID-19 concerns, students are expected to maintain a safe atmosphere when attending class. The Green and Gold Promise clearly articulates the expectations that UVM has for students, faculty, and staff to remain compliant with all COVID-19 recommendations from the federal CDC, the State of Vermont, and the City of Burlington. This includes following all rules regarding facial coverings and social distancing when attending class. If you do not follow these guidelines, we will ask you to leave the class. If you forget your mask, you cannot enter the class and should go back and retrieve your mask. The Code of Student Conduct outlines policies related to violations of the Green and Gold Promise. Sanctions for violations include fines, educational sanctions, parent notification, probation, and suspension.

You may need to isolate or quarantine this semester due to COVID-19 concerns. If this is the case, Student Health Services will inform the Dean's office. We will then contact the Dean's office for confirmation that a student is in quarantine or isolation. Students, especially those who are asymptomatic in quarantine, will be expected to continue their academic work. We will work with students in quarantine and isolation in a mutually agreed-upon format to make up missed course material. Students are encouraged to email me directly to discuss how to proceed in the course during quarantine/isolation.

## Email Policy

Students are encouraged to email me directly to clarify any questions concerning homework, projects, or materials covered in the course. Please note: The subject line of emails should only contain the words "CHEM 051: Exploring Chemistry". Emails will be filtered using this subject line to ensure that they are not mistakenly missed. We will not respond to emails that do not contain these words in the subject line. Unless there is an emergency, we will generally only answer students' emails once a day, at around 8:30.

## Important University Policies

### Mandated Reporter

Students should feel welcome to come to me for advice and guidance regarding their academic journey at UVM. Students can also come to me to report misconduct of any kind. Please note: I am a mandated reporter. We will have to report any misconduct that a student reports to the appropriate authorities at UVM.

### Academic Integrity

Offenses against the Code of Academic Integrity are deemed serious and insult the integrity of the entire academic community. Any suspected violations of the code are taken very seriously and will be forwarded to the Center for Student Ethics and Standards for further investigation. Violations of the Code of Academic Integrity—including any inappropriate collaboration, collusion, cheating, corroboration, plagiarism, or any other related offense—will be fully investigated according to the rules set by the UVM Academic Integrity Office and may be punishable with a score of zero for the assignment in question. Details can be found at

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

### Grade Appeals

If you would like to contest a grade, please follow the procedures outlined in this policy:

<https://www.uvm.edu/policies/student/gradeappeals.pdf>

### Code of Student Conduct

<http://www.uvm.edu/policies/student/studentcode.pdf>

### FERPA Rights Disclosure

The purpose of this policy is to communicate the rights of students regarding access to, and privacy of their student educational records as provided for in the Family Educational Rights and Privacy Act (FERPA) of 1974.

<http://catalogue.uvm.edu/undergraduate/academicinfo/ferparightsdisclosure/>

### Promoting Health and Safety

The University of Vermont's number one priority is to support a healthy and safe community:

Center for Health and Wellbeing <https://www.uvm.edu/health>

Counseling & Psychiatry Services (CAPS): Please call 802-656-3340 for assistance.

C.A.R.E. 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/studentaffairs>

## Alcohol and Cannabis Statement

As a faculty member, I want you to get the most you can out of this course. You play a crucial role in your education and in your readiness to learn and fully engage with the course material. It is important to note that alcohol and cannabis have no place in an academic environment. They can seriously impair your ability to learn and retain information not only the moment you may be using, but up to 48 hours or more afterwards. In addition, alcohol and cannabis can:

- Cause issues with attention, memory and concentration
- Negatively impact the quality of how information is processed and ultimately stored
- Affect sleep patterns, which interferes with long-term memory formation

It is my expectation that you will do everything you can to optimize your learning and to fully participate in this course.

## Student Resources

### Technical Support for Students

Students, please read this technology check list to make sure you are ready for classes. Students should contact the Helpline (802-656-2604) for support with technical issues.

### Research and Citation Help

For help selecting research topics, finding information, citing sources, and more, ask a librarian. Although they are working remotely, librarians are always eager to help. You may ask questions by phone, e-mail, chat, or text, or make an appointment for an individual consultation with a librarian.

- Howe Library: <https://library.uvm.edu/askhowe>
- Dana Medical Library: <https://dana.uvm.edu/help/ask>
- Silver Special Collections Library: <https://specialcollections.uvm.edu/help/ask>

### Student Learning Accommodations

In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact SAS, the office of Disability Services 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.

Contact SAS:

A170 Living/Learning Center

802-656-7753

[access@uvm.edu](mailto:access@uvm.edu)

<https://www.uvm.edu/access>

## Diversity, Equity, and Inclusion Resources

The Division of Diversity, Equity, and Inclusion Center believes excellence should be inclusive of the entire University of Vermont (UVM) community and is steadfastly committed to this belief. Every day, our Division strives to make our work accessible, affirming, and action-oriented to help ensure excellence is inclusive of everyone.

<https://www.uvm.edu/diversity>

### UVM Prism Center

The Prism Center serves the diverse queer and trans communities at the University of Vermont. We support and empower lesbian, gay, bisexual, transgender and queer students, as well as students whose identities fall in between or expand beyond those categories, and work to create a campus community where people of all sexual and gender identities can thrive.

<https://www.uvm.edu/prism>

### Interfaith Center

Each of us engages those questions differently, perhaps through religious tradition, philosophy, or spiritual practice. No matter how you make meaning of your life, you are welcome at the Interfaith Center for reflection, spiritual practice, education, and community building.

<https://www.uvm.edu/interfaithcenter>

## Mosaic Center for Students of Color

The Mosaic Center for Students of Color (MCSC) vision is to create a diverse and rich community of empowered, engaged, and enthusiastic students of color at UVM. We fully support the holistic development of self-identified students of color so that they can obtain their goals for academic achievement, personal growth, identity formation, and cultural development.

<https://www.uvm.edu/mcsc>

## Women & Gender Equity Center

The UVM Women & Gender Equity Center cultivates joyful community while advancing gender equity across identities. We envision a brave, diverse, and equitable learning environment for all members of the UVM community. We provide advocacy services for those in our community who have experienced sexual or intimate partner violence, and strive to provide programming, education, and events that ask our community to explore the intersections of their gender and other identities.

<https://www.uvm.edu/wagecenter>

## Tips for Success

Students are encouraged to attend class, do homework, come to office hours, work with peers, and ask questions to help them succeed in class. In case the course goes fully online, there are a few resources for students on remote/online learning:

- Checklist for success in <https://learn.uvm.edu/about/support-for-students/checklist-online-credit-courses/>
- Academic support for online courses: <https://www.uvm.edu/academicsuccess/online-learning-student-resources-remote-instruction>

Helpful resources other than the instructor include the Undergraduate/Graduate Writing Center, Supplemental Instruction, Learning Co-op tutors, and supplemental course materials.)

## Course Schedule (Subject to Change)

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Sept 22	Week 1	Intro/Safety/Experiment Design
Sept 29	Week 2	ACS Exam/Class Discussion
Sept 6	Week 3	Nitrocellulose Paper Reaction Chemistry
Sept 23	Week 4	Atomic Structure
Sept 30	Week 5	NO CHEM 051 LAB
Oct 7	Week 6	Blue Bottle Chemical Clock
Oct 14	Week 7	Penny-gold Experiment
Oct 21	Week 8	Synthesis and Spectroscopy of Metal-Ligand Complexes
Oct 28	Week 9	NO CHEM 051 LAB
Nov 4	Week 10	Stoichiometry of Ligand Metal Complexes
Nov 11	Week 11	Effects of pH on Electronic Structure, Lab Check-out
Nov 18	Week 12	NO CHEM 051 LAB
Nov 25	Week 13	Thanksgiving Recess NO CHEM 051 LAB
Dec 2	Week 14	NO CHEM 051 LAB
Dec 9	Week 15	NO CHEM 051 LAB

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