

SYLLABUS

Introduction:

All of chemistry, including bonding, reactions, thermodynamics, kinetics, and material properties, ultimately emerges from the motion and behavior of atoms and molecules. Quantum mechanics, a model to describe this motion and behavior, is one of the most accurate and fruitful theoretical frameworks in the history of science. *The value in knowing quantum mechanics comes from its predictive power.* The better you know quantum mechanics, the better you will understand what causes the atoms to act the way they do that results in the chemistry that we observe and use.

- Course:** **Chemistry 327**
Physical Chemistry II Laboratory – Quantum Chemistry and Molecular Spectroscopy
Section 1: Thursday 1:30 – 5:00 PM in Sator Hall room 208
Section 2: Tuesday 1:30 – 5:00 PM in Sator Hall room 208
There is no final exam for this course.
- Instructor:** Dr. Lane Votapka
Office location: Rohr Science room 305E
Office hours: MWF 10:30 – 12:00
Thursday 11-12:30 and by appointment
Phone: 619-849-2270
Email: lvotapka@pointloma.edu (I will be able to answer emails between 8 AM and 6 PM).
- Text:** There is no textbook for this course. Lab handouts will be distributed by hand or downloaded from the course website.
- Course Description:** This laboratory course has been designed to accompany CHE 326, which is an investigation of matter from a quantum chemistry perspective with particular emphasis on the theoretical concepts and their implications for molecular spectroscopy.
- Learning Outcomes:** Upon completing this course you will:
1. Have developed more sophisticated mental models of wave functions, energy levels, atomic structures, chemical bonding, spectroscopy, computational chemistry, and statistical mechanics as grounded in the fundamentals of quantum theory.
 2. Be able to use spectroscopic and computational techniques to probe the details of atomic and molecular systems.
- Lab Reports and Presentations** There will be six experiments in total, one approximately every two weeks. Two weeks after starting an experiment, right before starting the

next experiment, you will need to submit a lab report, make a presentation, or conduct a “chalk talk”. More details about these assignments will be described in the first few lab sessions or through handouts, or both.

Attendance:

Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See [Academic Policies](#) in the Undergraduate Academic Catalog.

ADDITIONAL NOTE: The above paragraph is the official PLNU policy, but I think that the timing of this lab course can be a bit more flexible than usual. Everyone should plan to arrive at the beginning of the section time on the first day of an experiment for your fellow students’ presentations and my instructions for how to conduct that week’s experiment. After that, since equipment is scarce, we will have to take turns using equipment, and you are free to come and go if it isn’t your turn to run the experiment. If you’ve already performed your experiment for that week, you don’t have to come in, but I will try to accommodate you during that time to answer your questions or allow you to re-conduct your experiment if you desire to.

Grading:

You’ll submit six reports, presentations, or chalk talks, but I’ll drop the lowest grade. That leaves five lab reports, presentations, or chalk talks at 20% each.

A	90%	C	70%
A-	88%	C-	68%
B+	86%	D+	66%
B	80%	D	60%
B-	78%	D-	58%
C+	76%	F	< 58%

Lecture:

CHE 326 is a separate lecture course related to this material

PLNU Mission

To teach ~ to shape ~ to send

Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service is an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Final Examination Policy There is no final exam for this course.

PLNU copyright policy Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

PLNU Academic Honesty Policy Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See [Academic Policies](#) for definitions of kinds of academic dishonesty and for further policy information.

PLNU Academic Accommodations policy If you have a diagnosed disability, please contact PLNU's Disability Resource Center (DRC) within the first two weeks of class to demonstrate need and to register for accommodation by phone at 619-849-2486 or by e-mail at DRC@pointloma.edu. See [Disability Resource Center](#) for additional information.

Laboratory Schedule –Tentative--:

Section 1	Section 2	Experiment
Aug 31	Aug 29	First week of classes: no lab meetings
Sept 7, 14	Sept 5, 12	Lab 1: the photoelectric effect
Sept 21, 28	Sept 19, 26	Lab 2: conjugated dyes
Oct 5, 12	Oct 3, 10	Lab 3: rotational and vibrational spectroscopy of HCl and DCl
Oct 19, 25	Oct 17, 23	Lab 4: To be announced
Nov 2, 9	Oct 31, 7	Lab 5: To be announced
Nov 16	Nov 14	Special topic
Nov 23	Nov 21	Thanksgiving break: no lab meetings
Nov 30, Dec 7	Nov 28, Dec 5	Lab 6: computational chemistry with Hyperchem