

	Department of Chemistry, College of Natural and Social Sciences
	CHE 3025 Physical Chemistry I 3 Units
Spring 2022	

Meeting days: MWF	Instructor title and name: Dr. David Gleason-Rohrer
Meeting times: 8:30-9:25	Phone: Chem dept. 619-849-2469
Meeting location: Latter Hall 2	Email: gleason.rohrer@gmail.com
Final Exam: May 6 th 7:30AM	Office location and hours: Sunday 7-9PM
	Thursday 7-9PM

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.

COURSE DESCRIPTION

Study of classical thermodynamics as it is applied to physical and chemical systems. Includes discussion of the three laws and their application to thermochemistry, reaction energetics and chemical equilibrium. The first part of this course is designed to direct students through a detailed study of the fundamentals of thermodynamics. The course content in this part will center on the laws of thermodynamics with particular attention given to the application of these laws to chemical systems. This part will include the study of such concepts as heat, work, enthalpy, entropy, standard states, phase diagrams, colligative properties, free energy, and equilibrium. The second part of the course will focus on the fundamentals of chemical kinetics, and reaction dynamics.

COURSE LEARNING OUTCOMES

By the end of the course students will be able to:

- 1) Define and use the concepts of internal energy, enthalpy, entropy, and Gibbs energy to characterize equilibrium and predict the direction of spontaneous change.
- 2) Use simplifying models to represent complex physical and/or chemical systems for the purpose of fundamental analysis.
- 3) Use the laws of thermodynamics, the concepts of chemical kinetics, and techniques from calculus, to solve physical and chemical problems appropriate for the undergraduate chemistry major. Students will acquire and/or improve specific skills useful for future

work in science or science related fields. Students will identify and improve generalized problem-solving strategies.

CHEM PLO 2 (UV-vis) and BCHM PLO 3 (UV-vis) will be assessed directly by faculty laboratory instructors' observation of students' use of instruments.

REQUIRED TEXTS AND RECOMMENDED STUDY RESOURCES

Thermodynamics, Statistical Thermodynamics, & Kinetics, 4th Edition, Thomas Engel and Philip Reid, San Francisco, Pearson / Benjamin Cummings, 2019.

COURSE CREDIT HOUR INFORMATION

In the interest of providing sufficient time to accomplish the stated Course Learning Outcomes, this class meets the PLNU credit hour policy for a 3 unit class delivered over 14 weeks. It is anticipated that students will spend a minimum of 37.5 participation hours per credit hour on their coursework. For this course, students will spend an estimated 112.5 total hours meeting the course learning outcomes. **Expect to spend significantly more time if your mathematical foundations are weak.** Specific details about how the class meets the credit hour requirement can be provided upon request.

ASSESSMENT AND GRADING

Grade points will be earned according to the following breakdown:

Midterm Exam 1	25%
Midterm Exam 2	30%
Final Exam	25%
Homework	10%
Participation/Presentations	10%

Grades will be assigned according to the following approximate scale. Plus and minus grades are assigned within these brackets.

Approximate	85 - 100%	A
Grading	75 - 85%	B
Scale	65 - 75%	C
	55 - 65%	D
	0 - 55%	F

STATE AUTHORIZATION

State authorization is a formal determination by a state that Point Loma Nazarene University is approved to conduct activities regulated by that state. In certain states outside California, Point Loma Nazarene University is not authorized to enroll online (distance education) students. If a student moves to another state after admission to the program and/or enrollment in an online course, continuation within the program and/or course will depend on whether Point Loma Nazarene University is authorized to offer distance education courses in that state. It is the

student's responsibility to notify the institution of any change in his or her physical location. Refer to the map on [State Authorization](#) to view which states allow online (distance education) outside of California.

INCOMPLETES AND LATE ASSIGNMENTS

All assignments are to be submitted/turned in by the beginning of the class session when they are due—including assignments posted in Canvas. Incompletes will only be assigned in extremely unusual circumstances. **Assignments may be resubmitted for a maximum of half of the missed points.** Problem sets are a record of the practice that you put into the mathematical techniques. As such, all homework should be handwritten either on paper or a tablet and uploaded. Calculations can be performed on Excel or comparable spreadsheet and uploaded.

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. *Copying solutions to homework problems from another student or an online service (Chegg, Bartleby, etc.) prevent students from practicing the mathematical concepts needed to understand physical chemistry. There are usually tell-tale signs of copying, and if it is detected, the student will receive a zero for the assignment, and a zero for the participation portion of the overall grade.* 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

While all students are expected to meet the minimum standards for completion of this course as established by the instructor, students with disabilities may require academic adjustments, modifications or auxiliary aids/services. At Point Loma Nazarene University (PLNU), these students are requested to register with the Disability Resource Center (DRC), located in the Bond Academic Center (DRC@pointloma.edu or 619-849-2486). The DRC's policies and procedures for assisting such students in the development of an appropriate academic adjustment plan (AP) allows PLNU to comply with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act. Section 504 prohibits discrimination against students with special needs and guarantees all qualified students equal access to and benefits of PLNU programs and activities. After the student files the required documentation, the DRC, in conjunction with the student, will develop an AP to meet that student's specific learning needs. The DRC will thereafter email the student's AP to all faculty who teach courses in which the student is enrolled each semester. The AP must be implemented in all such courses.

If students do not wish to avail themselves of some or all of the elements of their AP in a particular course, it is the responsibility of those students to notify their professor in that course. PLNU highly recommends that DRC students speak with their professors during the first two weeks of each semester about the applicability of their AP in that particular course and/or if they do not desire to take advantage of some or all of the elements of their AP in that course.

PLNU ATTENDANCE AND PARTICIPATION POLICY

Regular and punctual attendance at all class sessions is considered essential to optimum academic achievement. If the student is absent for more than 10 percent of class sessions (virtual or face-to-face), the faculty member will issue a written warning of 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.

SPIRITUAL CARE

Please be aware PLNU strives to be a place where you grow as whole persons. To this end, we provide resources for our students to encounter God and grow in their Christian faith.

If students have questions, a desire to meet with the chaplain or have prayer requests you can contact the [Office of Spiritual Development](#)

USE OF TECHNOLOGY

In order to be successful in the online environment, you'll need to meet the minimum technology and system requirements; please refer to the [Technology and System Requirements](#) information. Additionally, students are required to have headphone speakers compatible with their computer available to use. If a student is in need of technological resources please contact student-tech-request@pointloma.edu.

Problems with technology do not relieve you of the responsibility of participating, turning in your assignments, or completing your class work.

CLASS SCHEDULE

Session	Topics	Readings
January 12, 14	Fundamental Concepts of Thermodynamics	Chapter 1; sections 1.1-1.5
January 19, 21, 24, 26	Heat, Work, Internal Energy, Enthalpy, and the First Law of Thermodynamics	Chapter 2; sections 2.1-2.14
January 28, 31 February 2, 4	The Importance of State Functions: Internal Energy and Enthalpy	Chapter 3; sections 3.1-3.7
February 7, 9	Thermochemistry	Chapter 4; sections 4.1-4.5
February 11, 14, 16, 18, 21	Entropy and the Second Law of Thermodynamics	Chapter 5; sections 5.1-5.10
February 23 (or 24)	Midterm Exam 1 (Chapters 1-5)	

February 25, 28 March 2, 4	Chemical Equilibrium	Chapter 6; sections 6.1-6.13
March 14	The Properties of Real Gases	Chapter 7; sections 7.1-7.5
March 16, 18	Phase Diagrams and the Relative Stability of Solids, Liquids, and Gases	Chapter 8; sections 8.1-8.6
March 21, 23	Ideal and Real Solutions	Chapter 9; sections 9.1-9.3, 9.6-9.7, 9.10-9.11
March 25	Electrolyte Solutions	Chapter 10; sections 10.1-10.5
March 28, 30	Electrochemical Cells, Batteries, and Fuel Cells	Chapter 11; sections 11.1-11.12
April 1 (or March 31)	ACS Midterm Exam 2 (Chapters 1-11)	
April 4, 6	Kinetic Theory of Gases	Chapter 16; sections 16.1-16.7
April 8	Transport Phenomena	Chapter 17; sections 17.1-17.3, 17.5-17.6, 17.8
April 11, 13, 20	Elementary Chemical Kinetics	Chapter 18; sections 18.1-18.10, 18.13, 18.15
April 22, 25, 27, 29	Complex Reaction Mechanisms	Chapter 19; sections 19.1-19.2, 19.4-19.10
Comprehensive Final Exam, Friday, May 6th 7:30-10:00AM. Location TBA		