


Course Syllabus

[Jump to Today](#)
 **Edit**

 <p>POINT LOMA NAZARENE UNIVERSITY</p>	<p>Chemistry</p> <p>CHE1003L: Intro to General, Organic, and Biological Chemistry Lab</p> <p>1 Unit</p>
<p>Fall 2020</p>	

<p>Meeting days & times:</p> <p>Monday 2:45 - 5:35 pm</p> <p>Monday 6:00 - 8:50 pm</p> <p>Tuesday 9:30 am - 12:20 pm</p> <p>Tuesday 1:30 - 4:20 pm</p> <p>Tuesday 6:00 - 8:50 pm</p> <p>Wednesday 6:00 - 8:50 pm</p> <p>Thursday 6:00 - 8:50 pm</p>	<p>Instructor :</p> <p>Dr. Katherine Maloney</p> <p>Dr. Allegra Aron</p> <p>Dr. Pieter Baker</p> <p>Dr. Pieter Baker</p> <p>Dr. Leah Rowland</p> <p>Dr. Leah Rowland</p> <p>Dr. Leah Rowland</p>	<p>Meeting location:</p> <p>KM's Zoom room (https://pointloma.zoom.us/j/3709958838)</p> <p>AA's Zoom room</p> <p>PB's Zoom room</p> <p>PB's Zoom room</p> <p>LR's Zoom room</p> <p>LR's Zoom room</p> <p>LR's Zoom room</p>
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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.

Foundational Explorations Mission

PLNU provides a foundational course of study in the liberal arts informed by the life, death, and resurrection of Jesus Christ. In keeping with the Wesleyan tradition, the curriculum equips students with a broad range of knowledge and skills within and across disciplines to enrich major study, lifelong learning, and vocational service as Christ-like participants in the world's diverse societies and culture.

COURSE DESCRIPTION

From the PLNU Catalog: An inquiry-based laboratory that is a co-requisite for CHE1003.

COURSE LEARNING OUTCOMES

By the end of the course, you will:

- Explain the importance of chemistry in the life of bacteria.
- Design an experiment to test the effect of culture conditions on antibiotic production in bacteria.
- Select appropriate techniques to separate and identify molecules from a complex sample.
- Analyze genomic and metabolomic data to identify what kinds of antibiotics a bacterium has the 'blueprints' to produce, versus which antibiotics it actually produces.
- Analyze and communicate your findings back into the global Tiny Earth Network.

REQUIRED TEXTS AND RECOMMENDED STUDY RESOURCES

Since this is the pilot of a brand new course, your 'text' will be excerpts from the not-yet-published lab manual, included here in the Canvas course. *(Note that your input on the readings is very welcome and may shape the final manuscript!)*

TENTATIVE LAB SCHEDULE

Week	Readings & Assignments	Lab Agenda
1	Section 0: Tiny Earth Lab Syllabus & Schedule Protocols: Patch plate & Agar overlay assay Week 1 postlab assignment	Introductions The Antibiotic Crisis Group Learning Agreement Antimicrobial testing
2	Section 1: Natural Products Protocols: Liquid-liquid extraction, swab plate, disk diffusion assay VR Extraction & Prelab Assignment Week 2 Postlab Assignment	Is 'natural' better? Antimicrobial results <i>Streptomyces</i> sp. K14/6 extraction Disk diffusion bioassay

3	<p>Section 2: How natural products are made</p> <p>Protocols: TLC, TLC Bioautography</p> <p>Week 3 Prelab Assignment</p> <p>Week 3 Postlab Assignment</p>	<p>The Central Dogma</p> <p>Why do microbes make antibiotics?</p> <p>Disk diffusion results</p> <p><i>Streptomyces</i> sp. K14/6 TLC & TLC Bioautography</p>
4	<p>Section 2: How natural products are made</p> <p>Protocol: AntiSMASH</p> <p>Week 4 Prelab Assignment</p> <p>Week 4 Postlab Assignment</p>	<p>Biosynthesis & classes of natural products</p> <p>TLC Bioautography results</p> <p>AntiSMASH tutorial, and analysis of 'your' antibiotic from Week 1</p>
5	<p>Meet Tiny Earth Strain AH48</p> <p>Section 3: Turning on antibiotic production lines</p> <p>Protocol: Growing in liquid culture, growing in solid culture</p> <p>Week 5 Prelab Assignment</p> <p>Week 5 Postlab Assignment</p>	<p>Intro to Tiny Earth strain AH48</p> <p>Discussion & Vote: Culture conditions</p> <p>Develop explicit instructions for your instructor to follow</p> <p>Antimicrobial testing</p>
6	<p>Meet Tiny Earth Strain AH48</p> <p>Protocol: AntiSMASH</p> <p>Week 6 Prelab Assignment</p> <p>Week 6 Postlab Assignment</p>	<p>Antimicrobial results</p> <p>Inoculation</p> <p>AntiSMASH analysis of AH48</p>
7	<p>Section 4: Extraction</p> <p>Protocols: Liquid-liquid extraction, Disk diffusion bioassay</p> <p>Week 7 Prelab Assignment</p> <p>Week 7 Postlab Assignment</p>	<p>AH48 Extraction</p> <p>Disk diffusion bioassay</p>
8	<p>Section 5: Chemical separations</p>	<p>Disk diffusion results (and comparison with other</p>

	<p>Protocols: TLC, TLC Bioautography</p> <p>Week 8 Prelab Assignment</p> <p>Week 8 Postlab Assignment</p>	<p>sections)</p> <p>TLC of AH48 (and comparison with other sections)</p> <p>TLC Bioautography of AH48</p>
9	<p>Section 6: Mass Spectrometry</p> <p>Protocols: Molecular networking with GNPS</p> <p>Week 9 Prelab Assignment</p> <p>Week 9 Postlab Assignment</p>	<p>TLC Bioautography results</p> <p>Examine LCMS data of AH48</p> <p>Construct molecular network for AH48</p>
10	<p>Section 5: Chemical separations</p> <p>Protocols: Prep TLC</p> <p>Week 10 Prelab Assignment</p> <p>Week 10 Postlab Assignment</p>	<p>Prep TLC</p> <p>Prioritize bands for further analysis</p> <p>Set up disk diffusion of selected bands (if time)</p>
11	<p>Section 7: NMR spectroscopy</p> <p>Week 11 Prelab Assignment</p> <p>Week 11 Postlab Assignment</p>	<p>Acquire ^1H NMR and HSQC spectra on selected bands</p> <p>Identify compound classes using NMR</p>
12	<p>Section 7: NMR spectroscopy</p> <p>Section 8: Dereplication</p> <p>Protocol: SMART NMR</p> <p>Week 12 Prelab Assignment</p> <p>Week 12 Postlab Assignment</p>	<p>SMART NMR</p> <p>Identify candidate structures using SMART & compare with LCMS data from Week 9</p>
13	<p>Section 5: Chemical Separations</p> <p>PCA Primer</p> <p>Protocol: Exploring big datasets with GNPS</p> <p>Week 13 Prelab Assignment</p> <p>Week 13 Postlab Assignment</p>	<p>Exploring many Tiny Earth strains in GNPS/Qiime2</p> <p>Forming hypotheses about where to look for new antibiotics</p>

14	Group Report to TECH	Buffer period
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All readings are from the Tiny Earth Chemistry guide, and will be provided on Canvas.

ASSESSMENT AND GRADING

The activities described above will contribute to your total course grade according to the following distribution:

Prelab assignments	30%
Postlab assignments	60%
Final Group Report to TECH	10%

Student grades will be posted in the Canvas grade book throughout the course. Letter grades will be assigned at the end of the course based on your percentage of total possible points, according to the following scale:

Standard Grade Scale Based on Percentages

A	B	C	D	F
A 93-100	B+ 87-89	C+ 77-79	D+ 67-69	F Less than 59
A- 90-92	B 83-86	C 73-76	D 63-66	
	B- 80-82	C- 70-72	D- 60-62	

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 \(https://www.pointloma.edu/offices/office-institutional-effectiveness-research/disclosures\)](https://www.pointloma.edu/offices/office-institutional-effectiveness-research/disclosures) 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.

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](http://catalog.pointloma.edu/content.php?catoid=18&navoid=1278) [_ \(http://catalog.pointloma.edu/content.php?catoid=18&navoid=1278\)](http://catalog.pointloma.edu/content.php?catoid=18&navoid=1278) 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 (<mailto: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 (a) 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

This course is being taught in the hybrid format, which means that you will engage with your fellow classmates and instructor in real time during weekly *synchronous* class meetings on Zoom and you will engage with other material *asynchronously* online.

Regular and punctual attendance at all **synchronous** 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 instructor 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. In addition, a portion of the credit hour content will be delivered **asynchronously** and attendance will be determined by submitting the assignments by the posted due dates. See [Academic Policies](#) (https://catalog.pointloma.edu/content.php?catoid=46&navoid=2650#Class_Attendance) in the Undergraduate Academic Catalog. If absences exceed these limits but are due to university excused health issues, an exception will be granted.

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](#) (<https://www.pointloma.edu/offices/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](#) (<https://help.pointloma.edu/TDClient/1808/Portal/KB/ArticleDet?ID=108349>) 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 (<mailto: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.











ASSIGNMENTS AT-A-GLANCE












The table below lists our assignments and their due dates. Click on any assignment to review it.













Course Summary:

Date	Details
Sat Aug 22, 2020	<p>Week 1 Postlab Assignment: Elevator Speech  (https://canvas.pointloma.edu/courses/53858/assignments/526837) (Section 1-CHE1003L) due by 2:45pm</p>
	<p>Week 1 Postlab Assignment: Elevator Speech  (https://canvas.pointloma.edu/courses/53858/assignments/526837) (Section 2-CHE1003L) due by 6pm</p>

Date	Details	
Sun Aug 23, 2020	 Week 1 Postlab Assignment: Elevator Speech (https://canvas.pointloma.edu/courses/53858/assignments/526837) (Section 3-CHE1003L)	due by 9:30am
	 Week 1 Postlab Assignment: Elevator Speech (https://canvas.pointloma.edu/courses/53858/assignments/526837) (Section 4-CHE1003L)	due by 1:30pm
	 Week 1 Postlab Assignment: Elevator Speech (https://canvas.pointloma.edu/courses/53858/assignments/526837) (Section 5-CHE1003L)	due by 6pm
Mon Aug 24, 2020	 Discussion 1 responses due (https://canvas.pointloma.edu/calendar?event_id=46249&include_contexts=course_53858)	12am
	 Week 2 Prelab Assignment: VR Extraction of Acetylsalicylic Acid (https://canvas.pointloma.edu/courses/53858/assignments/535876) (Section 1-CHE1003L)	due by 2:45pm
	 Week 1 Postlab Assignment: Elevator Speech (https://canvas.pointloma.edu/courses/53858/assignments/526837) (Section 6-CHE1003L)	due by 6pm
	 Week 2 Prelab Assignment: VR Extraction of Acetylsalicylic Acid (https://canvas.pointloma.edu/courses/53858/assignments/535876) (Section 2-CHE1003L)	due by 6pm
Tue Aug 25, 2020	 Week 2 Prelab Assignment: VR Extraction of Acetylsalicylic Acid (https://canvas.pointloma.edu/courses/53858/assignments/535876) (Section 3-CHE1003L)	due by 9:30am
	 Week 2 Prelab Assignment: VR Extraction of Acetylsalicylic Acid (https://canvas.pointloma.edu/courses/53858/assignments/535876) (Section 4-CHE1003L)	due by 1:30pm
	 Week 1 Postlab Assignment: Elevator Speech (https://canvas.pointloma.edu/courses/53858/assignments/526837) (Section 7-CHE1003L)	due by 6pm
	 Week 2 Prelab Assignment: VR Extraction of Acetylsalicylic Acid (https://canvas.pointloma.edu/courses/53858/assignments/535876) (Section 5-CHE1003L)	due by 6pm

Date	Details	due by
Wed Aug 26, 2020	 Week 2 Prelab Assignment: VR Extraction of Acetylsalicylic Acid (https://canvas.pointloma.edu/courses/53858/assignments/535876) (Section 6-CHE1003L)	due by 6pm
Thu Aug 27, 2020	 Week 2 Prelab Assignment: VR Extraction of Acetylsalicylic Acid (https://canvas.pointloma.edu/courses/53858/assignments/535876) (Section 7-CHE1003L)	due by 6pm
Sat Aug 29, 2020	 Week 3 Prelab Assignment: Is natural better? (https://canvas.pointloma.edu/courses/53858/assignments/541245) (Section 1-CHE1003L)	due by 2:45pm
	 Week 3 Prelab Assignment: Is natural better? (https://canvas.pointloma.edu/courses/53858/assignments/541245) (Section 2-CHE1003L)	due by 6pm
Sun Aug 30, 2020	 Week 3 Prelab Assignment: Is natural better? (https://canvas.pointloma.edu/courses/53858/assignments/541245) (Section 3-CHE1003L)	due by 9:30am
	 Week 3 Prelab Assignment: Is natural better? (https://canvas.pointloma.edu/courses/53858/assignments/541245) (Section 4-CHE1003L)	due by 1:30pm
	 Week 3 Prelab Assignment: Is natural better? (https://canvas.pointloma.edu/courses/53858/assignments/541245) (Section 5-CHE1003L)	due by 6pm
Mon Aug 31, 2020	 Week 2 Postlab Assignment: Extraction Questions (https://canvas.pointloma.edu/courses/53858/assignments/535891) (Section 1-CHE1003L)	due by 2:45pm
	 Week 2 Postlab Assignment: Extraction Questions (https://canvas.pointloma.edu/courses/53858/assignments/535891) (Section 2-CHE1003L)	due by 6pm
	 Week 3 Prelab Assignment: Is natural better? (https://canvas.pointloma.edu/courses/53858/assignments/541245) (Section 6-CHE1003L)	due by 6pm

Date	Details	
Tue Sep 1, 2020	 Week 2 Postlab Assignment: Extraction Questions (https://canvas.pointloma.edu/courses/53858/assignments/535891) (Section 4-CHE1003L)	due by 1:30pm
	 Week 2 Postlab Assignment: Extraction Questions (https://canvas.pointloma.edu/courses/53858/assignments/535891) (Section 5-CHE1003L)	due by 6pm
	 Week 3 Prelab Assignment: Is natural better? (https://canvas.pointloma.edu/courses/53858/assignments/541245) (Section 7-CHE1003L)	due by 6pm
	 Week 2 Postlab Assignment: Extraction Questions (https://canvas.pointloma.edu/courses/53858/assignments/535891) (Section 3-CHE1003L)	due by 9:30pm
Wed Sep 2, 2020	 Week 2 Postlab Assignment: Extraction Questions (https://canvas.pointloma.edu/courses/53858/assignments/535891) (Section 6-CHE1003L)	due by 6pm
Thu Sep 3, 2020	 Week 2 Postlab Assignment: Extraction Questions (https://canvas.pointloma.edu/courses/53858/assignments/535891) (Section 7-CHE1003L)	due by 6pm
Mon Sep 7, 2020	 Week 3 Postlab Assignment: TLC & Bioassays (https://canvas.pointloma.edu/courses/53858/assignments/536312) (Section 1-CHE1003L)	due by 2:45pm
	 Week 4 Prelab Assignment: Natural product building blocks (https://canvas.pointloma.edu/courses/53858/assignments/536311) (Section 1-CHE1003L)	due by 2:45pm
	 Week 3 Postlab Assignment: TLC & Bioassays (https://canvas.pointloma.edu/courses/53858/assignments/536312) (Section 2-CHE1003L)	due by 6pm
	 Week 4 Prelab Assignment: Natural product building blocks (https://canvas.pointloma.edu/courses/53858/assignments/536311) (Section 2-CHE1003L)	due by 6pm
	 Week 4 Postlab Assignment: antiSMASH Questions (https://canvas.pointloma.edu/courses/53858/assignments/536317)	due by 11:59pm

Date	Details	
Tue Sep 8, 2020	 Week 3 Postlab Assignment: TLC & Bioassays (https://canvas.pointloma.edu/courses/53858/assignments/536312) (Section 3-CHE1003L)	due by 9:30am
	 Week 4 Prelab Assignment: Natural product building blocks (https://canvas.pointloma.edu/courses/53858/assignments/536311) (Section 3-CHE1003L)	due by 9:30am
	 Week 3 Postlab Assignment: TLC & Bioassays (https://canvas.pointloma.edu/courses/53858/assignments/536312) (Section 4-CHE1003L)	due by 1:30pm
	 Week 4 Prelab Assignment: Natural product building blocks (https://canvas.pointloma.edu/courses/53858/assignments/536311) (Section 4-CHE1003L)	due by 1:30pm
	 Week 3 Postlab Assignment: TLC & Bioassays (https://canvas.pointloma.edu/courses/53858/assignments/536312) (Section 5-CHE1003L)	due by 6pm
	 Week 4 Prelab Assignment: Natural product building blocks (https://canvas.pointloma.edu/courses/53858/assignments/536311) (Section 5-CHE1003L)	due by 6pm
Wed Sep 9, 2020	 Week 3 Postlab Assignment: TLC & Bioassays (https://canvas.pointloma.edu/courses/53858/assignments/536312) (Section 6-CHE1003L)	due by 6pm
	 Week 4 Prelab Assignment: Natural product building blocks (https://canvas.pointloma.edu/courses/53858/assignments/536311) (Section 6-CHE1003L)	due by 6pm
Thu Sep 10, 2020	 Week 3 Postlab Assignment: TLC & Bioassays (https://canvas.pointloma.edu/courses/53858/assignments/536312) (Section 7-CHE1003L)	due by 6pm
	 Week 4 Prelab Assignment: Natural product building blocks (https://canvas.pointloma.edu/courses/53858/assignments/536311) (Section 7-CHE1003L)	due by 6pm
Mon Sep 14, 2020	 Week 8 Postlab Assignment: TLC Questions - incomplete (https://canvas.pointloma.edu/courses/53858/assignments/541136)	due by 11:59pm
Fri Nov 20, 2020	 Final Group Report to TECH (https://canvas.pointloma.edu/courses/53858/assignments/545557)	due by 5pm

Date**Details**



[Week 5 | Postlab Assignment: Culture conditions Questions](https://canvas.pointloma.edu/courses/53858/assignments/545586)
(<https://canvas.pointloma.edu/courses/53858/assignments/545586>)



[Week 6 | Postlab Assignment: antiSMASH Questions](https://canvas.pointloma.edu/courses/53858/assignments/545577)
(<https://canvas.pointloma.edu/courses/53858/assignments/545577>)



[Week 8 | Prelab Assignment: VR TLC of spinach juice - incomplete](https://canvas.pointloma.edu/courses/53858/assignments/541135)
(<https://canvas.pointloma.edu/courses/53858/assignments/541135>)
