

ANALYTICAL CHEMISTRY (CHE2013) SPRING 2020 SYLLABUS

INSTRUCTORS:

Dr. Sara Yu Choung

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Office Hours: M 1:00 – 3:00 pm

W 1:30 – 2:30 pm

R 9:30 – 11:00 am

F 11:00 am – 12:00 pm

and by appointment

Dr. David Lingner

Office: Rohr Science 328

Phone: 619-849-2470

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LECTURE (3 units): TR 11:05 am – 12:20 pm Latter 2

LABORATORY: Section 1 Tuesday 8:00 – 11:00 am Sator Hall 221
Section 2 Tuesday 1:30 – 4:30 pm Sator Hall 221

LEARNING MATERIALS:

1. *Textbook**: Daniel C. Harris, Quantitative Chemical Analysis, W.H. Freeman and Company, 9th edition 2016. ISBN-13: 9781319044053 (hard cover with Sapling code) or ISBN-13: 9781319044060 (loose leaf with Sapling code).
2. *Laboratory Notebook and Lab Coat*: Hayden-McNeil Scientific Lab Notebook and Lab Coat for \$10 from Dr. Choung
3. *Online Homework*: Sapling Learning www.saplinglearning.com/login (bundled with hard cover or loose leaf textbook or purchased separately for \$47 or with eText)
4. *Course Website*: Canvas <https://canvas.pointloma.edu>
5. *Scientific Calculator*
6. *Computer with Excel*
7. *Laboratory Safety Glasses*
8. *Optional Material*: Daniel C. Harris, Solution Manual for Quantitative Chemical Analysis, W.H. Freeman and Company, 9th edition 2016. ISBN-13: 9781464175633.

* This textbook is also used for Instrumental Analysis (CHE3070).

COURSE DESCRIPTION: Examination of the theories and techniques of quantitative chemical analysis, with some emphasis on instrumental methods. Classical methods such as gravimetry, titrimetry, spectroscopy, electrochemistry, and chromatography will be discussed and used.

LEARNING OUTCOMES:

At the end of this course, students will be able to:

- Evaluate analytical data by determining error and uncertainty and using statistical methods such as the F test, t test, paired t test, and Q test.
- Solve equilibrium problems related to precipitation, acid-base, complexation, and oxidation-reduction reactions.
- Understand the concepts of various gravimetric methods such as precipitation, volatilization, and particulate gravimetry.
- Explain the principles of titrimetric methods including acid-base, complexometric, redox, and precipitation titrations.
- Understand the concepts of various spectroscopic and electrochemical methods.
- Perform analytical laboratory techniques related to the topics listed above.

Program Learning Outcome ENVS PLO 2: Students will apply key concepts and principles in analytical chemistry including quantitative and instrumental analysis. This learning outcome will be assessed directly using the ACS Analytical Chemistry Exam.

PREREQUISITE: One year of General Chemistry

EVALUATION:

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

Lecture Examinations (3)	36%
Homework	10%
Quizzes, Pre-Class Assignments, In-Class Activities	10%
Lecture Final Examination	14%
Laboratory Work	20%
Laboratory Final Examination	10%

Letter grades will be assigned at the end of the course according to the following approximate scale:

A	90 – 100%
B	80 – 89%
C	70 – 79%
D	60 – 69%
NC/F	< 60%

(+) and (–) grades will be assigned within each bracket except there is no A+ grade.

ADMINISTRATION:

1. Attendance and Participation: You are responsible for all the material and announcements covered during lecture and lab. 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 [Class Attendance](#) in the Undergraduate Academic Catalog.
2. The use of portable electronic devices (phones, laptops, iPods, etc.) not related to the course is not permitted in the classroom or lab.
3. Online Homework: Homework will be assigned regularly through Sapling Learning (www.saplinglearning.com/login course ID: Point Loma Nazarene University - CHE 213 – Spring20 – CHOUNG). Go to <https://macmillan.force.com/macmillanlearning/s/article/Sapling-Learning-Registering-for-courses> for instructions on how to enroll in the course site. Sapling's technical support team can be reached by phone or webform at <https://macmillan.force.com/macmillanlearning/s/>
4. Successful completion of the homework is essential in mastering the course material. Late assignments will not be accepted.
5. Pre-Class Assignments, In-Class Activities and Quizzes: Pre-class assignments and in-class activities will be assigned and collected throughout the course. Quizzes will be given periodically throughout the course covering either the reading assignment or material already discussed in class. The lowest pre-class assignment, in-class activity or quiz score will be discarded when final grades are computed.
6. Exams: Three lecture exams, a lecture final exam, and a laboratory final exam will be given during the course. Make-up exams will be arranged only if the instructor is contacted prior to the scheduled exam time and then only if you present an institutionally valid excuse.
7. Laboratories: Attendance is mandatory at all laboratory sessions. If you must miss a lab for a valid reason, you should make prior arrangements with the instructor to see if you can attend the other lab section. A lab absence will result in a zero on that lab report and lab quiz. Experiments will be performed either individually, with a partner, or in a group. Each partner/group member must keep a record of their work in their own laboratory notebook to submit individually. Each partner must independently weigh samples, carry out titrations, etc. They cannot work together by participating in a joint titration, etc., with one partner functioning as a guide/consultant. Each partner must report at least one determination in the final value. Separate, individual lab notebook pages or a formal lab report will be submitted by each student. Each lab grade will be based on lab notebook entries, the accuracy and precision of the quantitative unknown determinations, or formal lab report. Lab quizzes will be given at the beginning of each new experiment, covering both the old and new experiments. Late labs will be penalized by deducting 5% for every day past the due date.

OTHER MATTERS:

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 (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.

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 Honesty](#) for definitions of kinds of academic dishonesty and for further policy information.

Final Examination Policy: Successful completion of this class requires taking the final examination **on its scheduled day**. The final examination schedule is posted on the [Undergraduate Records](#) site. No requests for early examinations or alternative days will be approved.

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 Mission: 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.

CHEMISTRY 2013 CLASS SCHEDULE

DATE	LECTURE TOPICS	CHAPTERS	LABORATORY*
1/16 (R)	Overview of Course and Syllabus The Analytical Process	0	No Lab
1/21 (T)	Chemical Measurements	1	Introduction and Check-in Preparing Solutions
1/23 (R)	Tools of the Trade	2	
1/28 (T)	Experimental Error	3	Statistical Evaluation of Acid-Base Indicators <i>(Preparing Solutions Due)</i>
1/30 (R)	Statistics	4	
2/4 (T)	Statistics	4	Statistical Evaluation of Acid-Base Indicators
2/6 (R)	Statistics	4	
2/11 (T)	Forensic Chemistry Dean Kirby (Drug Enforcement Administration)		Photometric Detection of Manganese in Steel <i>(Statistical Evaluation Due)</i>
2/13 (R)	EXAM #1	0 – 4	
2/18 (T)	Quality Assurance and Calibration Methods	5	Photometric Detection of Manganese in Steel
2/20 (R)	Quality Assurance and Calibration Methods	5	
2/25 (T)	Chemical Equilibrium	6	Bulk Drug Analysis Using IR and HPLC
2/27 (R)	Chemical Equilibrium	6	
3/3 (T)	Let the Titrations Begin	7	Bulk Drug Analysis Using IR and HPLC <i>(Mn in Steel Due)</i>
3/5 (R)	Pharmaceutical Chemistry Dana Chreng (Ionis Pharmaceuticals, Inc.)		
3/10 (T) – 3/12 (R)	No Class – Spring Break		No Lab
3/17 (T)	Activity and the Systematic Treatment of Equilibrium	8	Complexometric Titration of Calcium with EDTA
3/19 (R)	EXAM #2	5 – 8	
3/24 (T)	No Class		Tour of Ionis Pharmaceuticals, Inc. in Carlsbad <i>(Bulk Drug Analysis Due in class Thursday)</i>
3/26 (R)	Monoprotic Acid-Base Equilibria	9	
3/31 (T)	Polyprotic Acid-Base Equilibria	10	Unknown Series Identification Redox/ICP**
4/2 (R)	Polyprotic Acid-Base Equilibria Acid-Base Titrations	10 11	

4/7 (T)	Acid-Base Titrations	11	Unknown Series Identification Redox/ICP** <i>(Ca-EDTA Due)</i>
4/9 (R)	No Class – Easter Recess		
4/14 (T)	EDTA Titrations	12	Check Out Review for Lab Final
4/16 (R)	Biological Drug Development Josh Haleen (Biogen Idec)		
4/21 (T)	No Class		EXAM #3 Chapters 9 – 12 <i>(Unknown Formal Lab Report Due in class Thursday)</i>
4/23 (R)	Fundamentals of Electrochemistry Electrodes and Potentiometry	14 15	
4/28 (T)	No Class		Laboratory Final Examination
4/30 (R)	Review for Final Exam	0 – 12, 14 – 15	
5/7 (R)	FINAL EXAM (10:30 am – 1:00 pm)	0 – 12, 14 – 15	No Lab

* Labs meet and are due on Tuesdays.

** Formal lab report