SOUTHERN CALIFORNIA UNIVERSITY OF HEALTH SCIENCES

General Chemistry II | Lecture and Lab
Academic Year 2021-2022

Course Information

Course Numbers	Total Credits	Time Requirement
CHEM216/CHEM216L	**4 (3 Lecture + 1 Lab)**	**75 hrs (Lecture 45hrs + Lab 30hrs)**

Course Details

Recommended Prerequisites

General Chemistry I Lecture/Lab (CHEM211 and CHEM211L) or equivalent.

Course Description

This course is the second in a two-part series, which further develops the concepts of chemical bonding to appreciate the size, shape, polarity, and macroscopic behavior of molecules. The processes of oxidation-reduction will be explained, mainly as they apply to biological systems. Solution chemistry will be introduced, stressing the concepts of equilibrium and colligative properties. Acid/base chemistry, including titrations, buffers, and pH will be studied. Organic chemistry will be introduced as a corollary to concepts presented in the college chemistry course.

Lecture and Laboratory Communication

A website will be set up on Canvas by your instructor.
Log in with your Username and password: **https://scuhs.instructure.com**

Faculty Information

Refer to the Canvas course page for this information.

Class Meeting Times

Refer to Canvas course page for this information.

Instructional Materials

Required Text(s)

Lecture: White, J., Anderson, B., Green B., and Hall, M. *Chemistry: Achieve for Interactive General Chemistry ISBN: 9781319257866,* 1st edition, 2021. An electronic textbook is provided to students through Canvas.

Lab: SCU General Chemistry Laboratory Manual (available on Canvas)

Provided Materials: PPE (Personal Protection Equipment): UVEX goggles, gloves, and flame-resistant lab coat.

Required Attire: Close-toed shoes, professional attire and lab coats are mandatory during all lab hours. No shorts, heels, or flip-flops will be allowed in the laboratory; hair longer than shoulder-length must be pulled back and held with a clip or hair tie. Gloves, goggles and additional safety equipment will be required per experiment.

Course Purpose

Student Learning Outcomes

At the conclusion of this course, a successful student should be able to:

1. Demonstrate thorough knowledge and understanding of the fundamental principles and core concepts of General Chemistry II. (CLO 1-73)
2. Recall the basic principles in the areas of thermodynamics, reaction rates, electrochemistry and buffers. (CLO 14, 73)
3. Solve chemical problems involving kinetics, equilibrium, thermodynamics and electrochemistry. (CLO 14-73)
4. Demonstrate proficiency in assembling basic laboratory glassware, performing fundamental laboratory techniques, making and recording relevant experimental observations and interpreting the results. (CLO 1,4-7, 13, 19-22, 28-29, 31-48, 33-54)

Course Learning Objectives: Please refer to the appendix for a full list of course objectives.

Course Schedule

(subject to slight modifications by the instructor)

Week	Lecture	Assessment
1	Introduction to Liquids and solids Solutions	Pre-Lecture Activity Learning Curve/Adaptive Modules Quiz Homework
2	Chemical Kinetics Chemical Equilibrium	Pre-Lecture Activity Learning Curve/Adaptive Modules Quiz Homework
3	Acid Base Theory	Pre-Lecture Activity Learning Curve/Adaptive Modules Quiz Homework Exam I (Chapter 12-15)
4	Chemical Thermodynamics Aqueous Equilibria	Pre-Lecture Activity Learning Curve/Adaptive Modules Quiz Homework
5	Electrochemistry	Pre-Lecture Activity Learning Curve/Adaptive Modules Quiz Homework Exam II (Chapter 16-19)

Tentative Grading Procedures

Lecture

Assignment	Total assignments	Weight
Pre-Lecture Activity	11	10%
Participation	10	10%
Learning Curve/Adaptive Modules Quiz	11	25%
Homework	11	15%
Exams	2	40%
	Total	100%

Lab Schedule

(subject to slight modifications by the instructor)

Laboratory	Assessment
Check-in: Check in/safety Worksheet for math review	Lab notebook
Experiment 1: Preparation of Solutions	Lab notebook
Experiment 2: Chemical Kinetics Iodine Clock	Quiz 1
Experiment 3: Lê Chateliers Principle	Lab notebook
Experiment 4: Hydrolysis, Weak Acids and Buffers	Lab notebook
Experiment 5: Standardization of NaOH and Titration of Sulfuric acid	Lab notebook Quiz 2
Experiment 5: Standardization of NaOH and Titration of Sulfuric acid/Titration worksheet	Lab notebook
Experiment 6: Weak Acid Ksp	Lab notebook Quiz 3
Experiment 7: Electrochemistry and Redox Reactions	Lab notebook
Review/Checkout	Quiz 4

Tentative Grading Procedures

Lab

Assessment	Weight (%)
Lab Quizzes	40
Lab Notebook	10
Prelabs	15
Post labs	25
Participation (discussions, worksheets etc)	10
Total	100

Grading scale:

Please note letter grades will be assigned only at the end of the trimester.

A = 90% to 100%

B = 80% - less than 90%

C = 70% - less than 80%

D = 60% - less than 70%

F = less than 60%

W = Withdrawal

Academic Integrity

Visit SCU's **Academic Integrity** page to review policies for professionalism and academic integrity. Course-specific academic integrity policies and consequences can be found in your Canvas course page.

Teaching Methods and Activities

Pre-lecture activity: Before each lecture, students complete very short 5-10 question quizzes to orient them to the lecture content and to give them an idea of the prerequisite knowledge they might need to full grasp each lecture's content. Pre-lecture activities are graded based on completion.

Participation: Students earn points by completing learning activities. Attendance is not the same thing as participation. Students are expected to be involved and engaged in all classroom activities (which may include activities graded on quality of participation).

Adaptive Module Quiz (may be called LearningCurve ©): In each Adaptive Module Quiz, your instructor has established a certain score you need to reach to demonstrate comprehension of the concept. That score is called

a target score. Once you reach the target score, you will receive full credit for completing the Adaptive Quiz. You must reach the target score to receive credit for the Adaptive Quiz. Questions get harder as you progress through the Adaptive Quiz, and you get more points for answering harder questions. You may be directed back to review portions of the electronic textbook if you miss a question.

Homework: Students reinforce concepts learned in class by completing the homework assignments. Homework assignments are open-book formative assessments where students can have unlimited attempts to practice problems. The highest score achieved is recorded in the gradebook. Homework must be completed by the due date – late submissions incur a 2% grade reduction for every day submitted late.

Exams: There are two exams in each class, a mid-term and a final exam. There will be questions that are similar to the learning curves, homework, and formative quizzes. The Exams are all on Canvas. Please pay attention to the due dates. They are final and will not be extended. You must use proctoring methods required by the instructor.

Laboratory

Attire for lab

Close-toed shoes, professional attire and lab coats are mandatory during all lab hours. No shorts, heels, or flip-flops will be allowed in the laboratory; hair longer than shoulder-length must be pulled back and held with a clip or hair tie. Gloves, goggles and additional safety equipment will be required per experiment.

Evaluation of Experimental Technique: You will be assessed on your general performance and regards for the rules of the laboratory and safety procedures.

Attendance for lab: Punctual attendance at each of your regularly scheduled laboratory and period is required. Additionally, you are required to stay until you and/or your group have completed the experiment. Check out with your lab instructor before leaving the laboratory after completing the experiment. You are expected to attend every one of your scheduled lab meeting times. However, if you find yourself in a situation where you are unable to attend lab, please email your instructor right away.

Lab Notebook: Students will be required to keep a laboratory notebook, and the instructor will grade notebook entries. The notebook allows you to accurately record experiment procedures and data, so you should write it so that someone else could repeat your experiments and get the same results. Among other things, this includes recording all spectroscopic and analytical data that you obtain from the experiment procedure. Further information about the lab notebook will be provided in class.

Pre-labs: Prelabs contain content questions that are intended to help you prepare for lab procedures. Pre-labs can be found in the lab manual and must be completed before each lab class.

Post-labs: Post-labs, or lab reports will consist of the report sheet(s), answers to post-lab questions and sometimes Excel plots of data analysis when appropriate. While the lab activity may be group-based, you must complete lab reports on your own (lab reports are not group assignments).

Laboratory Quizzes: Quizzes will be given the week after your experiment and its modality will be indicated by the Professor. These quizzes will be closely based on the pre-labs and lab reports.

Classroom Expectations

Please be professional, prompt, prepared, and polite at all times.

The professor will adhere to all policies as found in the Student Handbook. Cellular phones must be kept on silent during class and lab times. Students may not use a phone as a calculator. As a safety precaution, no food or drinks are allowed inside the lab, but there will be a designated break for eating and drinking outside of the lab.

Best Practices for Studying Chemistry

- Because of the demands of the course, successful chemistry students don't wait until exam time to begin studying. Instead, you should plan to follow the chemistry rule that every hour spent in class requires two to three hours of effort outside of class to succeed in this course. As an example, let's say you've just been assigned reading on Lewis structures. Don't let a day go by without learning how to write and interpret Lewis structures. Future work will most likely use these bonding diagrams, and they are likely to reappear in lectures, quizzes and exams. Procrastination doesn't simply mean that you won't understand Lewis structures—you'll also be lost for every subsequent reading and lecture that employs these diagrams. Procrastination in a chemistry course can quickly prove disastrous failure to learn foundational principles can make all future material seem nearly incomprehensible.
- Read before and read after each class. Skim the chapter before it is covered in lecture to become comfortable with some of the terms associated with each topic. Review each chapter after it is covered in class to enhance your understanding of what was covered in class.
- Participate during class by taking notes during class and looking over them afterwards. Don't skip class, arrive late, or leave early. Ask questions for clarification when you don’t understand the material.
- Stay on top of the homework and assignments. Do the assigned problems as close to the time as when the topic is covered in the class to increase the depth of your understanding of specific concepts and will help you learn the material more efficiently and effectively.
- Do not wait until the night before the homework is due to start the assignment. You will get more out of it if you take the time to really learn the concepts and review the material without being rushed.
- Find a group of students to study with. Seek out students dedicated to doing well in the course. This makes studying more fun and helps you learn the material better by teaching what you know and learning from your peers what you don’t know. Explaining these concepts to others will help you learn the material even better.
- Stay focused by finding an environment where you can study with few distractions.

University Policies

Accommodations

As a learning-centered community, Southern California University of Health Sciences recognizes that all students should be afforded the opportunity to achieve their academic and individual potential. The University recognizes and supports the standards set forth in Section 504 of the Rehabilitation Act and

the American with Disabilities Act (ADA). In accordance with its mission and federal and applicable state laws, the University is committed to making reasonable accommodations for qualified applicants for admission and enrolled students with disabilities. A student who needs accommodation(s) due to a disability should contact the Academic Support Office located in the Learning Resource Center.

Faculty and Dr./Patient Relationships

SCU faculty are highly skilled. However, per University Policy, health care is offered to students through the University Health System only. Neither preclinical nor clinical faculty can provide advice, assessment, treatment, or other elements that would be considered part of a Doctor-Patient relationship outside of a clinical setting established for that purpose.

Learning Activities

Students are expected to spend at least two hours for each lecture hour of course time per week in activities and assessments outside the classroom. Examples of activities include, but are not limited to: writing papers; reading articles or text; small group work; presentations; completing assignments; preparation for assessments; online activities and other activities that do not include direct instructor interaction and involvement.

All university policies apply to this course and all others. For full policy information please consult the university SCU Policy Manual. For a quick reference guide to the following policies: make-up examination, F-challenge examination, grade posting, results of failing grades, student support information, syllabus amendments, special needs, student conduct, and attendance, please consult the academic policies document housed on the **Online Student Services .**

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Course Learning Objectives:

At the conclusion of this course, a successful student should be able to:

Liquids, Solids, and Intermolecular Forces

1. Distinguish the difference between the characteristics of solids, liquids and gases.
2. Identify the Intermolecular Forces that hold condensed states together.
3. Understand how intermolecular are involved in Viscosity, Surface Tension, and Capillary Action.
4. Understand the process of Vaporization and Vapor Pressure.
5. Identify the differences between Sublimation and Fusion.
6. Understand Heating Curves and perform calculations.
7. Understand how to draw and read Phase Diagrams.

Solutions

8. Understand how Solutions are formed and how Intermolecular Forces are involved.
9. Understand the energy are involved in a Solution Formation.
10. Understand the factors that affect solubility of solutions.
11. Calculate Solution Concentrations using different units.
12. Identify and calculate Colligative Properties.
13. Understand Colligative Properties of Strong Electrolyte Solutions.

Kinetics

14. Determine the factors that influence the rate of a reactions
15. Express average rate and instantaneous rate.
16. Calculate rate of reaction based on initial concentrations.
17. Determine the overall order of a reaction.
18. Calculate the half-life of a reaction.
19. Determine how concentration changes over time by using integrated rate laws.
20. Determine how temperature and concentration affects the rate of the reactions
21. Understand the role a catalyst plays in a reaction
22. Determine the rate of a reactions though reactions mechanism.

Chemical Equilibrium

23. Calculate the Equilibrium Constant of a reaction.
24. Calculate the reaction Quotient of a reaction.
25. Understand how to express equilibrium with pressure.
26. Understand the relationship between K_c and K_p.
27. Compare Q and K to determine the direction of the reaction.
28. Solve equilibrium problems when initial concentrations are given.
29. Understand Le Chateliers' Principle by determining how Change in concentration, pressure temperature and catalyst will affect equilibrium.

Acids and Bases

30. Understand what causes heartburn.
31. Understand the Arrhenius definition of acids and bases.
32. Understand the definition of Bronsted-Lowry acids and bases.
33. Understand the strength of acids and perform calculations using the Acid Ionization Constant (K_a).
34. Understand the Autoionization of water

35. Perform pH calculations, of Strong Acids and Strong Bases.
36. Calculate $[H_3O^+]$ and $[OH^-]$ of Strong Acids and Strong Bases.
37. Calculate Percent Ionization of a Weak Acids.
38. Calculate $[H_3O^+]$ and $[OH^-]$ of Weak Acids and Weak Bases.
39. Understand Acid-Bases properties of Ions and Salts.
40. Calculate pH of Polyprotic Acids.
41. Understand the Strength and molecular structure of Acids.

Aqueous Ionic Equilibrium

42. Understand the definition of buffers.
43. Calculate the pH of Buffer Solutions.
44. Perform pH Buffer calculations using Henderson-Hasselbalch Equation.
45. Calculate pH of Buffer solutions containing base and its conjugate acid.
46. Understand the Effectiveness of a buffer by understanding Buffer Ran and Buffer Capacity.
47. Perform Titration calculations of Strong Acid and Strong Base.
48. Perform Titration calculation of Weak Acid and Strong Base
49. Understand Titrations curves.
50. Understand Titrations of a Polyprotic Acids.
51. Perform Solubility Equilibria calculations.
52. Understand Selective Precipitations.
53. Understand Qualitative Chemical Analysis
54. Preform Complex Ion Equilibria Calculations.

Thermodynamics

55. Understand Spontaneous and Nonspontaneous Processes.
56. Underhand the First Law of Thermodynamics.
57. Be able to explain Entropy and the relationship it has to the Second Law of Thermodynamics.
58. Understand how temperature affects Entropy.
59. Perform Entropy calculations.
60. Calculate Gibbs Free Energy.
61. Understand the Third Law of Thermodynamics.
62. Calculate Free energy of Chemical Reactions.
63. Calculate Free energy for Nonstandard States.
64. Perform calculations relating standard and nonstandard conditions.

Electrochemistry

65. Be able to balance Oxidation-Reduction Equations
66. Understand Voltaic Cells and how they generate electricity.
67. Be able to draw Voltaic Cells.
68. Understand how to write Electrochemical Electrode Cell Notations.
69. Calculate Standard Electrode Potentials.
70. Calculate concentration of cell potentials.
71. Understand how batteries generate electricity.
72. Understand how to predict products of Electrolysis.
73. Perform Stoichiometry of Electrolysis.