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

Course Information

Course Numbers	Total Credits	Time Requirement
CHEM211/CHEM211L	**4 (3 Lecture + 1 Lab)**	**75 hrs (Lecture 45hrs + Lab 30hrs)**

Course Details

Recommended Prerequisites

High School Diploma or equivalent; Introduction to Chemistry and College Algebra courses are highly recommended

Course Description

In this course, students will learn a quantitative introduction to atomic and molecular structure, states of matter, basic thermodynamics, and solutions. Several concepts within each topic will be demonstrated and sample problems discussed. Within this course, students become conversant with the scientific vernacular, chemical symbols and notations. Students will manipulate mathematical equations to appreciate the quantitative nature of atomic interactions. States of matter will be categorized, and the Periodic Table of the Elements will be studied to illustrate chemical periodicity and bonding. The gas laws will be introduced to understand statistical handling of large populations of atoms and molecules. Finally, the laws of thermodynamics will be introduced, including the concepts of enthalpy and entropy.

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 webpage for this information.

Class Meeting Times

Refer to Canvas course webpage 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 I Lab Manual (available on Canvas).

Provided materials: Flame resistant Lab Coat/Apron, Nitrile gloves, Safety Goggles. Only approved safety goggles must be worn. Approves safety goggles will be provided by lab instructor during the first lab session. Goggles are required during all lab sessions. No goggles, no experiment.

Required Attire: Close-toed shoes, professional attire and lab coats are mandatory during all lab hours. Gloves, goggles and additional safety equipment will be required per experiment.

Scientific Calculator: Graphics or text-memory calculators are not allowed for use during quizzes or exams in the lab. If you bring one you will have to take your quiz without a calculator. You are encouraged to obtain a scientific calculator with exponents and logarithms immediately, rather than the day before a quiz or an exam. It is important to be comfortable with the calculator that you are using, rather than to be struggling to locate the keys for certain mathematical operations. For example, a TI-30X IIS is acceptable.

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 I. (CLO 1-60)

2. Use dimensional analysis to solve quantitative problems and evaluate the results of calculations to make sure they are physically reasonable. (CLO 5-7, 16-26)

3. Be able to describe and define the general properties of gases (including define the units of pressure; define, apply, and carry out calculations using Boyle's, Charles', combined, and ideal gas laws; carry out calculations related to the density of gases, gas reaction stoichiometry, Dalton's Law of Partial Pressures, and gas diffusion; discuss kinetic molecular theory and deviations from ideality in gases (CLO 27-34)

4. Be able to describe and define the types of energy, first law of thermodynamics, energy changes in chemical reactions, and enthalpy; carry out calculations for thermochemical equations; describe and carry out calculations related to calorimetry; define, write and identify formation reactions and standard enthalpy of formation; perform calculations using direct and indirect methods to determine enthalpy changes in reactions and heats of solutions and dilution (CLO ,35-40)

5. Be able to describe the electronic structure of atoms, properties of elements in the periodic table, differentiate between types of bonds and determine 3D shapes of molecules (CLO ,41-60)

6. Demonstrate proficiency in assembling basic laboratory glassware, performing fundamental laboratory techniques, making and recording relevant experimental observations and interpreting the results. (CLO 1-60)

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	Chapter 1: Science and Measurement Chapter 2: Atoms and the Periodic Table	Pre-Lecture Activity Learning Curve/Adaptive Modules Quiz Participation Homework
2	Chapter 3: Compounds and the Mole Chapter 4: Chemical Reactions and Aqueous Solution	Pre-Lecture Activity Learning Curve/Adaptive Modules Quiz Participation Homework
3	Chapter 5: Stoichiometry Chapter 6: Thermochemistry	Pre-Lecture Activity Learning Curve/Adaptive Modules Quiz Homework Participation Exam 1 (modules 1-6)
4	Chapter 7: Gases Chapter 8: The Quantum Model of the Atom Chapter 9: Periodicity and Ionic Bonding	Pre-Lecture Activity Learning Curve/Adaptive Modules Quiz Homework Participation
5	Chapter 10: Covalent Bonding Chapter 11: Molecular Shapes and Bonding Theories	Pre-Lecture Activity Learning Curve/Adaptive Modules Quiz Homework Participation Exam 2 (modules 7-11)

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/Math review	Lab notebook Math Worksheet
Experiment 1: Mass, Volume and Significant Figures	Lab notebook
Experiment 2: Formula of a Hydrate	Lab notebook
Experiment 3: Reaction Stoichiometry	Lab notebook
Experiment 4: Beer's Law	Quiz 1 Lab notebook
Experiment 5: Analysis of unknown Solution	Lab notebook
Experiment 6: Calorimetry	Lab notebook
Experiment 7: Charles Law	Lab notebook
Experiment 8: Molecular modeling	Lab notebook
Review and Final Quiz	Quiz 2

Tentative Grading Procedures

Lab

Assessment	Weight (%)
Lab Quizzes	40
Lab Notebook	10
Pre labs	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

In classes with scheduled class time, lecture will be delivered in real time/live by the instructor. You must adhere to the attendance policy set out by the instructor for the class. In asynchronous classes, students will review lecture content in their own time. Due to the individualized nature of the learning, students should expect to spend as much time as needed based on individual attainment of prerequisite knowledge. Check your Canvas course page and student schedule to confirm the modality of the course that you are registered in.

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 the 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 afterward. 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 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.**

SOUTHERN CALIFORNIA UNIVERSITY OF HEALTH SCIENCES

Course Learning Objectives

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

1. Understand the Properties of Matter, the States of Matter and how is Matter the Central Theme in Chemistry.
2. Identify the Importance that Energy has to Chemistry.
3. Understand the Pre-chemical Traditions and the Impact of Lavoisier.
4. Be able to identify the parts of The Scientific Model.
5. Perform calculations using Units and Conversion Factors in order to Solve Chemistry Problems.
6. Identify and memorize the SI Units in Chemistry.
7. Be able to determine Significant Figures in Calculations, Precision, and Accuracy.
8. Understand the atomic differences between elements, Compounds, and Mixtures.
10. Understand the Mass Conservation Law, Definite Composition Law, and Multiple Proportions which the Atomic View of Matter.
11. Understand Dalton's Atomic Theory.
12. Understand the observations that led to the discovery of the Electron, Proton, Neutron, and Nucleus.
13. Be able to recognize, identify and form Ionic Compounds and Covalent Compounds.
14. Be able to name and write formulas for Ionic Compounds, Binary Covalent Compounds, and Organic Compounds.
15. Calculate Molecular Masses.
16. Understand Mixtures: Classification and Separation.
17. Stoichiometry of Formulas and Equations
18. Be able to define the Mole.
19. Calculate Molar Mass, Mole-Mass-Number Conversions, and Mass Percent.
20. Be able to determine Empirical Formulas, Molecular Formulas of an Unknown Compound.
21. Be able to Write and Balance Chemical Equations.
22. From a Chemical Equation be able to calculate Amounts of Reactant and Product by determining Limiting Reactants and Reaction Yields.
23. Perform Fundamentals Calculations of Solution using Stoichiometry, Molarity, and Solution Mole-Mass-Number Conversions.
24. Three Major Classes of Chemical Reactions
25. Understand the Role of Water as a Solvent.
26. Be able to Writing Equations for Aqueous Ionic Reactions.
27. Be able to Predict Whether a Precipitate Will Form.
28. Be able to write Acid-Base Reactions.
29. Be able to identify Oxidation-Reduction (Redox) Reactions and the oxidation numbers of each atom.
30. Gases and the Kinetic-Molecular Theory
31. Be able to identify and interconvert pressure units.
32. Identify and solve simple Gas Laws: Boyle's Law, Charles's Law, and Avogadro's Law.
33. Be able to use the ideal gas law to perform calculations.
34. Be able to apply the Ideal Gas Law to solve for molar volume, density, and molar mass of a gas.
35. Apply Dalton's law to calculate the partial pressure of gasses.
36. Understand the meaning of mean Free Path, Diffusion, and Effusion of Gases.
37. Be able to understand the Kinetic Molecular Theory of Gases.

38. Be able to explain the effect of effects of size and intermolecular forces real gases have.
39. Thermochemistry: Energy Flow and Chemical Change
40. Be able to explain the First Law of Thermodynamics.
41. Be able to quantify Heat and Work.
42. Be able to perform calculations involving ΔE for Chemical Reactions.
43. Be able to calculate the specific heat of metal using Calorimetry.
44. Be able to explain and calculate the Enthalpy of a chemical reaction.
45. Be able to determine Enthalpies of Reaction from Standard Enthalpies of Formation
46. Quantum Theory and Atomic Structure
47. Be able to explain the relationship between light and a wave.
48. Be able to explain the properties of a wave.
49. Understand how the photoelectric effect led to a quantized model of light.
50. Be able to explain how wave-particle duality leads to the current model of the H atom.
51. Be able to explain and identify the 3-quantum number.
52. Be able to identify the Shapes of Atomic Orbitals.
53. Electron Configuration and Chemical Periodicity
54. Understand the Development of the Periodic Table.
55. Be able to write electron Configurations and understand how the electrons Occupy Orbitals.
56. Identify valance electrons and explain their importance.
57. Be able to identify periodic Trends in the Size of Atoms and Effective Nuclear Charge
58. Be able to describe the properties of Ions: Electron Configurations, Magnetic Properties, Ionic Radii, and Ionization Energy.
59. Identify the trend for electron Affinities and Metallic Character.
60. Models of Chemical Bonding
61. Identify the 3 types of Chemical Bonds.
62. Understand how Valence Electrons can be represented with Dots.
63. Explain Ionic Bonding: Lewis Symbols and Lattice Energies.
64. Draw Covalent Bonding using Lewis dot structures.
65. Identify polar molecules by understating Electronegativity and Bond Polarity.
66. Draw Resonance structures.
67. Be able to calculate Formal Charge.
68. Identify the exceptions to the Octet Rule.
69. Calculate Bond Energies.
70. The Shapes of Molecules
71. Explain the VSEPR Theory and identify the Five Basic Shapes.
72. Explain how lone pairs affect the VSEPR Theory
73. Predict Molecular Geometries of the molecule
74. Theories of Covalent Bonding
75. Understand the Valance Bond (VB) Theory and Orbital Hybridization.
76. Understand The Model of Orbital Overlap and the Types of Covalent Bonds.
77. Draw Molecular Orbital (MO) Theory and Understand Electron Delocalization.