General Chemistry I | Lecture and Lab

Academic Year: 2020-2021

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: *Chemistry: The Molecular Nature of Matter and Change* by Silberberg/Amateis, 9e (Connect©) (ISBN-13: 978-1259631757) -OR- *Chemistry: A Molecular approach plus Mastering Chemistry with eText,* 3rd Ed., by Tro, Vincent & Libingston (ISBN: 13-978-0321804716). 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.

SOUTHERN CALIFORNIA UNIVERSITY OF HEALTH SCIENCES

Course Schedule

(subject to slight modifications by the instructor)

Day	Lecture	Assessment
1	Chapter 1: Keys to Studying Chemistry Chapter 2: Composition of Matter	Class Participation
2	Chapter 3: Stoichiometry of Formulas and Equations	Class participation
3	Chapter 4: Three Major Classes of Chemical Aqueous Reactions	**Exam 1**
4	Chapter 6: Thermochemistry	Class participation
5	Chapter 7: Quantum Theory and Atomic Structure Chapter 8: Electron Configuration and Chemical Periodicity	**Exam 2**
6	Chapter 9: Models and Chemical Bonding	Class participation
7	Chapter 10: The Shapes of Bonding	**Exam 3**
8	Chapter 11: Theories of Covalent Bonding	Class participation
9	Chapter 5: Gases and Kinetic-Molecular	Class participation
10	**Review and Final Exam**	**Exam 4**

Tentative Grading Procedures

Lecture

Assessment	Points	Weight (%)
Exam 1	100	16
Exam 2	100	16
Exam 3	100	16
Exam 4	100	16
Participation (in class mini quizzes/activities)	75	12
Homework	150	24
Total	625	100%

Lab Schedule

(subject to slight modifications by the instructor)

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

Tentative Grading Procedures

Lab

Assessment	Points	Weight (%)
Lab Quizzes (4 x 50 points)	200	52
Lab Notebook (2 x 80)	160	42
Participation	5	1
Worksheet	20	5
Total	385	100

Lab Notebook:

- Pre-Lab: 45% of Total Assignment points (includes title, purpose, hypothesis, materials and procedure)
- Post Lab: 45% of Total Assignment points (includes data, calculations, post lab questions, and discussion/conclusions)
- Neatness, grammar and clarity: 10% of Total assignment points

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

Grading procedures:

The format of this assessment may include multiple choice, short answer, labelling, fill-in-the-blank, or calculation examinations. Participation points are required and will be assigned by the instructor as the course progresses through your general performance and regards for the rules of the laboratory and safety procedures.

Academic Integrity

Visit SCU's **Academic Integrity** page to review policies for professionalism and academic integrity.

Teaching Methods and Activities

The course requires a significant time commitment from students. This commitment is both in terms of reading lecture outlines prior to reading the chapters, as well as reviewing the material.

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.

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

- 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 .**

SOUTHERN CALIFORNIA UNIVERSITY OF HEALTH SCIENCES

Course Learning Objectives

The general objective of this course is to prepare students for future courses in biology or health science. 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.

Free Energy and 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