

Sul Ross State University
Syllabus for General Chemistry I: CHEM 1311- 21296 (Spring 2020)

Class: General Chemistry I
Room: WSB 301
Time: MWF 11:00 am-11:50 am

Instructor: Dr. Hong Young Chang
Office: WSB 219
Office Hours: M-R 3:00-5:00pm
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Date: Jan 13 to May 06, 2020

OBJECTIVES

Student Learning Objectives (SLO):

A student graduating with the *chemistry major* is expected to demonstrate that (s)he is able to do the following:

1. Organic Chemistry—Students will be able to draw organic molecular structures and explain organic reactions, stereochemistry, structural analysis and reactions in biological systems.
2. Inorganic Chemistry—The student will be able to demonstrate understanding of coordination chemistry, valence theory, elementary actions and advanced molecular theory.
3. Analytical Chemistry—The student will be able to demonstrate an understanding of theory of analytical chemistry and conduct analytical analysis, including data analysis and calibration, equilibrium chemistry, gravimetric analysis, titrimetric analysis, spectroscopic analysis, and electrochemical analysis.
4. Physical Chemistry—The student will be able to demonstrate an understanding of the application and theory of physical chemistry, including topics such as atomic structure, electrochemistry, surface chemistry, solid-state chemistry, and thermodynamics.
5. Research—The student will collect and analyze published chemical literature and undertake a chemistry research project.

General Chemistry I Learning Objectives:

At the end of this course, a student should have a good understanding of:

1. The basic concepts and terms used in chemistry
2. The electronic structures of atoms and the periodic table
3. The basic concepts of chemical bonding
4. Chemical reactions in aqueous solutions
5. The ideal gas equation

Core Objectives (CO):

1. **Critical Thinking Skills** – Students will gain/improve their critical thinking ability by solving real life chemistry problems through inquiry, analysis, and evaluation of available information. Students will be tested on their critical thinking ability in exams and through lab experiments.
2. **Communication Skills** – Students will have the opportunity of improving communication skills through oral discussion and writing reports (i.e. observation, explanation, and conclusion, etc.) on the experiments done in the lab sessions.
3. **Empirical and Quantitative Skills** – Students will use the mathematical skills needed to manipulate and analyze numerical data obtained through experimentation in order to form conclusions.
4. **Teamwork** – Students will use team-spirit and consider different points of view to work effectively while conducting experiments as a team working toward a shared purpose or goal.

Text Book: “*General Chemistry: The Essential Concepts 7th Edition*” by Raymond Chang and Kenneth A. Goldsby, McGraw-Hill, New York, United States of America, **2014**. (Older editions such as the 5th or 6th editions are ok to use).

The SRSU library has one copy of this textbook in the “Textbook Collection” section. Please ask the library front desk if you need help finding this textbook.

Calculator: A scientific calculator is required for this course.

Cell phones **ARE NOT** permitted for use in exams and should be turned off during class time.

The following chapters will be covered in General Chemistry I:

Chapter 1: Basic Concepts: Classification of Matter; Physical and Chemical Properties of Matter; Measurement; Handling Numbers; Dimensional Analysis in Solving Problems

Chapter 2: Atoms, Molecules, and Ions

Chapter 3: Stoichiometry

Chapter 4: Reactions in Aqueous Solutions

Chapter 5: The Ideal Gas Equation

Chapter 7: The Electronic Structure of Atoms

Chapter 8: The Periodic Table

Chapter 9 and 10: Chemical Bonding

Homework & Assignments: There will be the problem-sets assigned for each chapter. **NO LATE HOMEWORK WILL BE ACCEPTED. *ELECTRONIC SUBMISSION OF HOMEWORK WILL NOT BE ACCEPTED.***

Examinations: There will be *three midterm* examinations and *a final* examination. The final is mandatory and comprehensive. **NO MAKE-UP EXAMS WILL BE GIVEN.**

NOTE: Homework and Exams MUST be completed in pen!

ATTENDANCE PRERESQUITE: BEING ABSENT FROM MORE THAN 9 LECTURES WILL RESULT IN FAILING THE COURSE.

PERCENTAGE BREAKDOWN OF MARKS:

Homework & Assignments: 25%

Each Midterm Exam (16.67%): 50%

Final Exam: 25%

Midterm Exam I: Wednesday February 5th

Midterm Exam II: Wednesday March 4th

Midterm Exam III: Friday April 3th

Final Exam: Tuesday, May 5th at 10:15 am–12:15 pm, WSB 301

Course Calendar

Lecture 1 (January 13): Discussion on Syllabus, importance of chemistry

Lecture 2 (January 15): Classifications of matter, overview of states and properties of matter, physicals and chemical changes, units of measurements (length, volume, density, and temperature etc.)

Lecture 3 (January 17): Scientific notation and significant figures, precision and accuracy

No Class: January 20, Day of Martin Luther King, Jr. (Holiday)

Lecture 4 (January 22): Discussion on selective questions and problems on chapter 1

Lecture 5 (January 24): Dalton's atomic theory, discoveries of subatomic particles (electron, proton, and neutron), Rutherford's atomic model (*Homework Chapter 1 due*)

Lecture 6 (January 27): Atomic number, mass number, isotopes, molecules, compounds, ions, molecular formula, empirical formula

Lecture 7 (January 29): Chemical nomenclature, naming of compounds, acids, bases, oxides, and oxoacids

Lecture 8 (January 31): Discussion on selective questions and problems on chapter 2

Lecture 9 (February 3): Exam Revision on chapter 1 & 2 (*Homework Chapter 2 due*)

Lecture 10 (February 5): Exam I (Chapter 1 & 2)

Lecture 11 (February 7): Molecular mass, mole, molar mass, atomic mass, formula mass and their relations

Lecture 12 (February 10): Chemical equations and balancing chemical equations

Lecture 13 (February 12): Calculations of product/reactant amounts using balanced chemical equations, limiting reagents, and percent yields

Lecture 14 (February 14): Discussion on selective questions and problems on chapter 3;

Lecture 15 (February 17): Terminologies related to solutions, electrolytes, non-electrolytes, precipitation reactions, writing balanced ionic equations (*Homework Chapter 3 due*)

Lecture 16 (February 19): Acid-base reactions and oxidation numbers; oxidation-reduction reactions – types with examples

Lecture 17 (February 21): Solution stoichiometry, concentration units, and gravimetric analysis; discussion on selective questions and problems on chapter 4

Lecture 18 (February 24): Physical properties of gases-relation between temperature, pressure, volume and amount of gases; Ideal gas law and its applications (*Homework Chapter 4 due*)

Lecture 19 (February 26): Gas stoichiometry – calculation of reactant/product amounts in gaseous reactions using ideal gas equation; Kinetic theory of ideal gases, deviation of ideal gas properties, modification ideal gas law for real gases

Lecture 20 (February 28): Discussion on selective questions and problems on chapter 5

Lecture 21 (March 2): Exam Revision on chapter 3, 4, & 5 (*Homework Chapter 5 due*)

Lecture 22 (March 4): Exam II (Chapter 3, 4, & 5)

Lecture 23 (March 6): Properties of light, black-body radiation and photo-electric effect

No Class: Spring Break (March 9 to March 13)

Lecture 24 (March 16): Atomic spectra and Bohr atomic theory

Lecture 25 (March 18): De Broglie equation, dual nature of particles, Schrodinger wave equation and orbital concept

Lecture 26 (March 20): Electronic configuration-Aufbau principle, Hund's rule, para-magnetism

Lecture 27 (March 23): Discussion on selective questions and problems on chapter 7

Lecture 28 (March 25): Introductory discussion on periodic table, classification of elements and electronic configuration of ions (*Homework Chapter 7 due*)

Lecture 29 (March 27): Periodic variation of properties of elements, Group properties of elements

Lecture 30 (March 30): Discussion on selective questions and problems on chapter 8

Lecture 31 (April 1): Exam Revision on chapters 7 & 8 (*Homework Chapter 8 due*)

Lecture 32 (April 3): Exam III (Chapter 7 & 8)

Lecture 33 (April 6): Basic concepts of chemical bonding, ionic bonds, lattice energy, and calculation of lattice energy, covalent bonds, polar covalent bonds and polarity

Lecture 34 (April 8): Lewis structures of molecules, formal charge calculation, Resonance structures and bond energy, and discussion on selective questions and problems on chapter 9

NO CLASS: GOOD FRIDAY (April 10)

Lecture 35 (April 13): Molecular geometry – Valence shell electron repulsion theory (*Homework Chapter 9 due*)

Lecture 36 (April 15): Prediction of molecular geometry and polarity

Lecture 37 (April 17): Molecular geometry – Valence bond and molecular orbital theories

Lecture 38 (April 20): Discussion on selective questions and problems on chapter 10

Lecture 39 (April 22): Review on chapters 9 and 10 (*Homework Chapter 10 due*)

Lecture 40 (April 24): Final Exam Revision (Chapter 1, 2 & 3)

Lecture 41 (April 27): Final Exam Revision (Chapter 4, 5, & 7)

Lecture 42 (April 29): Final Exam Revision (Chapter 8, 9, & 10)

Final Exam (comprehensive): Tuesday May 5th, at 10:15 am–12:15 pm, WSB 301

Students with Special Needs: *Sul Ross State University (SRSU) is committed to equal access in compliance with Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the student's responsibility to initiate a request for accessibility service. Please contact Ms. Rebecca Greathouse Wren, M.Ed., LPC-S, Director/Counselor, Accessibility Services Coordinator, Ferguson Hall (Suite 112) at 432.837.8203; mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas 79832. E-mail: rebecca.wren@sulross.edu Students should then contact the instructor as soon as possible to initiate the recommended accommodations.*

Scholastic Dishonesty: *Students who violate the University rules on scholastic dishonesty are subject to penalties, including the possibility of an F in the course and/or dismissal from the University. All assignments (including homework) need to be individually completed and not copied from another student's work.*