



General Chemistry I (CHEM 1311)

Credit: 3 semester credit hours (3 hours lecture)

Prerequisite: MATH 1314 College Algebra (3 SCH version) or equivalent academic preparation

Co-requisite: CHEM 1111 General Chemistry I (lab)

Course Description

Fundamental principles of chemistry for majors in the sciences, health sciences, and engineering; topics include measurements, fundamental properties of matter, states of matter, chemical reactions, chemical stoichiometry, periodicity of elemental properties, atomic structure, chemical bonding, molecular structure, solutions, properties of gases, and an introduction to thermodynamics and descriptive chemistry.

Required Textbook and Materials:

1. *Chemistry the Central Science*, by Brown, LeMay, Bursten, Murphy, Woodward & Stoltzfus, 14th edition. Pearson Publishing.
 - a. ISBN: 13:9780134414232
2. Mastering Chemistry access code (combined with the book or stand-alone). Access it via Blackboard under “Mastering Chemistry” folder. Course ID: **guo28823**
3. Scientific calculator.
4. Scantrons.
5. #2 pencils.
6. Internet access via a laptop, a tablet, or a smart phone.

Recommended

1. *Student Solutions Manual to Red Exercises for Chemistry: The Central Science*, by Brown, LeMay, Bursten, Murphy, Woodward & Stoltzfus, 14th edition. Pearson Publishing.
 - a. ISBN: 13: 9780134552231

Course Objectives

Upon successful completion of this course, students will:

1. Define the fundamental properties of matter.
2. Classify matter, compounds, and chemical reactions.
3. Determine the basic nuclear and electronic structure of atoms.
4. Identify trends in chemical and physical properties of the elements using the periodic table.
5. Describe the bonding in and the shape of simple molecules and ions.
6. Solve stoichiometric problems.
7. Write chemical formulas.
8. Write and balance equations.
9. Use the rules of nomenclature to name chemical compounds.
10. Define the types and characteristics of chemical reactions.
11. Use the gas laws and basics of the Kinetic Molecular Theory to solve gas problems.
12. Determine the role of energy in physical changes and chemical reactions.
13. Convert units of measure and demonstrate dimensional analysis skills.

Approved 08/2021

CORE Objectives

1. Critical Thinking: to include creative thinking, innovation, inquiry, and analysis.
2. Communication: to include effective development, interpretation and expression of ideas through written, oral and visual communications.
3. Empirical and Quantitative Skills: to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions.
4. Teamwork: to include the ability to consider different points of view, and to work effectively with others to support a shared purpose or goal.

Course Outline

A. INTRODUCTION: MATTER, ENERGY, AND MEASUREMENTS

1. The Study of Chemistry
 2. Classifications of Matter
 3. Properties of Matter
 4. The Nature of Energy
 5. Units of Measurement
 6. Uncertainty in Measurement
 7. Dimensional Analysis
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B. ATOMS, MOLECULES, AND IONS

1. The Atomic Theory of Matter
 2. The Discovery of Atomic Structure
 3. The Modern View of Atomic Structure
 4. Atomic Weights
 5. The Periodic Table
 6. Molecules and Molecular Compounds
 7. Ions and Ionic Compounds
 8. Naming Inorganic Compounds
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C. CHEMICAL REACTION AND REACTION STOICHIOMETRY

1. Chemical Equations
 2. Simple Patterns of Chemical Reactivity
 3. Formula Weights
 4. Avogadro's Number and the Mole
 5. Empirical Formulas from Analyses
 6. Quantitative Information from Balanced Equations
 7. Limiting Reactants
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D. REACTIONS IN AQUEOUS SOLUTION

1. General Properties of Aqueous Solutions
 2. Precipitation Reactions
 3. Acids, Bases, and Neutralization Reactions
 4. Oxidation-Reduction Reactions
 5. Concentrations of Solutions
 6. Solution Stoichiometry and Chemical Analysis
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E. THERMOCHEMISTRY

1. The Nature of Chemical Energy
 2. The First Law of Thermodynamics
 3. Enthalpy
 4. Enthalpies of Reaction
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CHEM 1311
Course Syllabus

5. Calorimetry
 6. Hess's Law
 7. Enthalpies of Formation
- F. ELECTRONIC STRUCTURE of ATOMS
1. The Wave Nature of Light
 2. Quantized Energy and Photons
 3. Line Spectra and the Bohr Model
 4. The Wave Behavior of Matter
 5. Quantum Mechanics and Atomic Orbitals
 6. Representations of Orbitals
 7. Many-Electron Atoms
 8. Electron Configurations
 9. Electron Configurations and the Periodic Table
- G. PERIODIC PROPERTIES of the ELEMENT
1. Development of the Periodic Table
 2. Effective Nuclear Charge
 3. Sizes of Atoms and Ions
 4. Ionization Energy
 5. Electron Affinity
 6. Metals, Nonmetals, and Metalloids
 7. Trends for Group 1A and Group 2A Metals
 8. Trends for Selected Nonmetals
- H. BASIC CONCEPTS of CHEMICAL BONDING
1. Lewis Symbols and the Octet Rule
 2. Ionic Bonding
 3. Covalent Bonding
 4. Bond Polarity and Electronegativity
 5. Drawing Lewis Structures
 6. Resonance Structures
 7. Exceptions to the Octet Rule
 8. Strengths and Lengths of Covalent Bonds
- I. MOLECULAR GEOMETRY and BONDING THEORIES:
1. Molecular Shapes
 2. The VSEPR Model
 3. Molecular Shape and Molecular Polarity

Grade Scale

90 – 100	A
80 – 89	B
70 – 79	C
60 – 69	D
0 – 59	F

Course Evaluation

Final grades will be calculated according to the following criteria:

Homework	20%
Test # 1	15%
Test # 2	15%
Test # 3	15%
Common assignment	15 %
Final exam	20%

Course Policies

1. No food, drinks, or use of tobacco products in class.
 2. During class time, all electronic devices need to be turned to silent or off, unless prior approval has been given by instructor to have them set to vibrate. (Permission will only be given in emergency situations.) It shall be considered a breach of academic integrity (cheating) to use or possess on your body any of the following devices during any examination unless it is required for that examination and approved by the instructor:
 - cell phone
 - smart watch/watch phone
 - laptop
 - tablet
 - electronic communication devices (including optical)
 - earphones connected to or used as electronic communication devices.
- 1st Offense:** The exam will be taken from the student and the student will receive a grade of ZERO (0) for the exam which will be averaged into the student's class average and there will be NO MAKEUP of the test.
- 2nd Offense:** The student will be removed from the class and will receive a grade of FAILING (F) for the entire lecture and lab grade. Students with special needs and/or medical emergencies or situations should communicate with their instructor regarding individual exceptions/provisions. It is the student's responsibility to communicate such needs to the instructor.
3. Do not bring children to class.
 4. No late assignments will be accepted.
 5. No makeup exams will be given. In case of an emergency (**a proof must be submitted**), the final exam will replace the grade of the missed exam. **It is the student's responsibility to obtain missed lecture notes and class handouts and assignments.**
 6. Attendance policy: Roll will be taken daily at the beginning of the class. If you walk in after attendance has been taken you will be counted absent. Your attendance is documented by using LIT Starfish system.
 7. If you wish to drop a course, the student is responsible for initiating and completing the drop process. If you stop coming to class and fail to drop the course, you will earn an F in the course.

Technical Requirements (for courses using Blackboard)

The latest technical requirements, including hardware, compatible browsers, operating systems, software, Java, etc. can be found online at:

[https://help.blackboard.com/en-](https://help.blackboard.com/en-us/Learn/9.1_2014_04/Student/015_Browser_Support/015_Browser_Support_Policy_A)

[us/Learn/9.1_2014_04/Student/015_Browser_Support/015_Browser_Support_Policy_A](https://help.blackboard.com/en-us/Learn/9.1_2014_04/Student/015_Browser_Support/015_Browser_Support_Policy_A)

functional broadband internet connection, such as DSL, cable, or Wi-Fi is necessary to maximize the use of the online technology and resources.

Disabilities Statement

The Americans with Disability Act of 1990 and Section 504, Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. LIT provides reasonable accommodations as defined in the Rehabilitation Act of 1973, Section 504 and the American with Disability Act of 1990, to students with a diagnosed disability. The Special Populations Office is located in the Eagles' Nest Room 129 and helps foster a supportive and inclusive educational environment by maintaining partnerships with faculty and staff, as well as promoting awareness among all members of the Lamar Institute of Technology community. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409)839-2018. You may also visit the online resource at Special Populations - Lamar Institute of Technology (lit.edu)

Student Code of Conduct Statement

It is the responsibility of all registered Lamar Institute of Technology students to access, read, understand and abide by all published policies, regulations, and procedures listed in the *LIT Catalog and Student Handbook*. The *LIT Catalog and Student Handbook* may be accessed at www.lit.edu or obtained in print upon request at the Student Services Office. Please note that the online version of the *LIT Catalog and Student Handbook* supersedes all other versions of the same document

Starfish

LIT utilizes an early alert system called Starfish. Throughout the semester, you may receive emails from Starfish regarding your course grades, attendance, or academic performance. Faculty members record student attendance, raise flags and kudos to express concern or give praise, and you can make an appointment with faculty and staff all through the Starfish home page. You can also login to Blackboard or MyLIT and click on the Starfish link to view academic alerts and detailed information. It is the responsibility of the student to pay attention to these emails and information in Starfish and consider taking the recommended actions. Starfish is used to help you be a successful student at LIT.

<https://lit.edu/student-success/starfish>