



General Chemistry II (CHEM 1312)

Credit: 3 semester credit hours (3 hours lecture)

Prerequisite: CHEM 1411 General Chemistry I (lecture + lab) or

CHEM 1311 General Chemistry I (lecture) and CHEM 1111 General Chemistry I (lab) or

CHEM 1309 General Chemistry for Engineering Majors (lecture) and CHEM 1109 General Chemistry for Engineering Majors (lab) or

CHEM 1409 General Chemistry for Engineering Majors (lecture + lab)

Course Description

Chemical equilibrium; phase diagrams and spectrometry; acid-base concepts; thermodynamics; kinetics; electrochemistry; nuclear chemistry; an introduction to organic chemistry and descriptive inorganic 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.
3. Scientific calculator.
4. Scantrons.
5. #2 pencils.

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
2. Internet access via a laptop, a tablet, or a smart phone.

Course Objectives

Upon the completion of this course, the student should be able to:

1. State the characteristics of liquids and solids, including phase diagrams and spectrometry.
2. Articulate the importance of intermolecular interactions and predict trends in physical properties.
3. Identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationships.
4. Identify and balance oxidation-reduction equations, and solve redox titration problems.
5. Determine the rate of a reaction and its dependence on concentration, time, and temperature.
6. Apply the principles of equilibrium to aqueous systems using LeChâtelier's Principle to predict the effects of concentration, pressure, and temperature changes on equilibrium mixtures.

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7. Analyze and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy.
8. Discuss the construction and operation of galvanic and electrolytic electrochemical cells, and determine standard and non-standard cell potentials. Define nuclear decay processes.
9. Describe basic principles of organic chemistry and descriptive inorganic chemistry.

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. Gases

1. Characteristics of Gases
 2. Pressure
 3. The Gas Laws
 4. The Ideal-Gas Equation
 5. Further Applications of the Ideal-Gas Equation
 6. Gas Mixtures and Partial Pressures
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B. Liquids and Intermolecular Forces

1. A Molecular Comparison of Gases, Liquids, and Solids
 2. Intermolecular Forces
 3. Select Properties of Liquids
 4. Phase Changes
 5. Vapor Pressure
 6. Phase Diagrams
 7. Liquid Crystals
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C. Properties of Solutions

1. The Solution Process
 2. Saturated Solutions and Solubility
 3. Factors Affecting Solubility
 4. Expressing Solution Concentration
 5. Colligative Properties
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D. Chemical Kinetics

1. Factors That Affect Reaction Rates
 2. Reaction Rates
 3. Concentration and Rate Laws
 4. The Change of Concentration with Time
 5. Temperature and Rate
 6. Reaction Mechanisms
 7. Catalysis
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E. Chemical Equilibrium

1. The Concept of Equilibrium

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2. The Equilibrium Constant
 3. Understanding and Working with Equilibrium Constants
 4. Heterogeneous Equilibria
 5. Calculating Equilibrium Constants
 6. Applications of Equilibrium Constants
 7. Le Châtelier's Principle
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- F. Acid-Base Equilibrium
1. Arrhenius Acids and Bases
 2. Brønsted–Lowry Acids and Bases
 3. The Autoionization of Water
 4. The pH Scale
 5. Strong Acids and Bases
 6. Weak Acids
 7. Weak Bases
 8. Relationship Between K_a and K_b
 9. Acid–Base Properties of Salt Solutions
 10. Acid–Base Behavior and Chemical Structure
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- G. Additional Aspects of Aqueous Equilibria
1. The Common-Ion Effect
 2. Buffers
 3. Acid–Base Titrations
 4. Solubility Equilibria
 5. Factors That Affect Solubility
 6. Precipitation and Separation of Ions
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- H. Chemical Thermodynamics
1. Spontaneous Processes
 2. Entropy and the Second Law of Thermodynamics
 3. The Molecular Interpretation of Entropy and the Third Law of Thermodynamics
 4. Entropy Changes in Chemical Reactions
 5. Gibbs Free Energy
 6. Free Energy and Temperature
 7. Free Energy and the Equilibrium Constant
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- I. Electrochemistry:
1. Oxidation States and Oxidation–Reduction Reactions
 2. Balancing Redox Equations
 3. Voltaic Cells
 4. Cell Potentials under Standard Conditions
 5. Free Energy and Redox Reactions
 6. Cell Potentials under Nonstandard Conditions
 7. Batteries and Fuel Cells
 8. Corrosion
 9. Electrolysis
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Grade Scale

90 – 100	A
80 – 89	B
70 – 79	C

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60 – 69	D
0 – 59	F

Course Evaluation

Final grades will be calculated according to the following criteria:

1. Three major tests	300 Points
2. Final Exam	100 Points
3. Post Lecture Homework	100 Points
4. Common Assignment (CORE presentation)	100 Points
5. Bonus points	50 Points

To calculate your final grade divide your total points by 600.

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 make up 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: two absences are allowed. If a student is tardy to class or departs early three times, it will be equal to one absence. Each absence beyond two absences will result in a 5 points deduction from your final grade. 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.
 - a. 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)

[us/Learn/9.1](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 Disabilities Act of 1992 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. Among other things, these statutes require that all students with documented disabilities be guaranteed a learning environment that provides for reasonable accommodations for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409) 880-1737 or visit the office in Student Services, Cecil Beeson Building. You may also visit the online resource at <http://www.lit.edu/depts/stuserv/special/defaults.aspx>

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.

