

## Syllabus for CHEM 1311 (Fall 2014) Section 2

**Class:** General Chemistry I  
Room: WSB 307  
Time: TR 8:00-9:15am  
Lab: Monday 2:00-3:50pm (Section 1)  
Monday 4:00-5:50pm (Section 2)  
Tuesday 2:00-3:50pm (Section 3)

**Instructor:** Dr. David Leaver  
Office: WSB 318  
Office Hours: TR 3:00-5:00pm  
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### *Program Learning Objectives (PLO):*

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

1. Explain atomic and molecular structures, bonding, thermodynamics, chemical equilibria and kinetics, stoichiometry, and electrochemical processes;
2. Write and explain organic reactions, stereochemistry, and reactions in biological systems;
3. Use essential modern instruments to perform chemistry experiments in the laboratory;
4. Write a review on a topic of his/her choice using recent literatures; and
5. Summarize basic principles of research design and analyze experimental data using appropriate computer programs (e.g. Excell, Sigma-plot, etc.) in regards to the chemistry discipline.

### *Student Learning Objectives (SLO):*

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.

**Lecture sessions are designed to fulfill PLO 1, CO – 1, 2, and 3, and lab sessions are designed to fulfill PLO 3, CO 1-4.**

**Text:** General Chemistry by Raymond Chang (5<sup>th</sup> Edition or newer); Lab Manual: Freshman Chemistry by Rangra and Houston

The following chapters will be covered:

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

**Chapter 2:** Atoms, Molecules, and Ions (SLO2)

**Chapter 3:** Stoichiometry (SLO 1)

**Chapter 4:** Reactions in Aqueous Solutions (SLO 2)

**Chapter 5:** The Ideal Gas Equation (SLO 5)

**Chapter 7:** The Electronic Structure of Atoms (SLO 2)

**Chapter 8:** The Periodic Table (SLO 2)

**Chapter 9 and 10:** Chemical Bonding (SLO 3)

**Homework:** There will be problems assigned for each chapter. **NO LATE HOMEWORK WILL BE ACCEPTED.**

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

**ATTENDANCE PRERESQUITE: BEING ABSENT FROM MORE THAN 6 LECTURES WILL RESULT IN FAILING THE COURSE.**

## **PERCENTAGE BREAKDOWN OF MARKS:**

Homework: 15%

Each Midterm Exam (15%): 45%

Final Exam: 40%

**Midterm Exam I:** Thursday, September 25<sup>th</sup>

**Midterm Exam II:** Thursday, October 16<sup>th</sup>

**Midterm Exam III:** Tuesday, November 11<sup>th</sup>

**Final Exam:** Thursday, December 11<sup>th</sup>

## **Course Calendar (Section 2)**

**Lecture 1 (August 26):** Discussion on Syllabus, importance of chemistry

**Lecture 2 (August 28):** Classifications of matter, overview of states and properties of matter, physical and chemical changes, units of measurements (length, volume, density, temperature etc.), and Scientific notation and significant figures

**Lecture 3 (September 2):** Precision and accuracy; discussion on selective questions and problems on chapter 1

**Lecture 4 (September 4):** Dalton's atomic theory, discoveries of subatomic particles (electron, proton, and neutron), Rutherford's atomic model, atomic number, mass number, and isotopes; Homework 1 due

**Lecture 5 (September 9):** Molecules, compounds, ions, molecular formula, empirical formula, chemical nomenclature, naming of compounds, acids, bases, oxides, and oxoacids

**Lecture 6 (September 11):** Discussion on selective questions and problems on chapter 2; Homework 2 due

**Lecture 7 (September 16):** Review on chapters 1 and 2

**Lecture 8 (September 18):** Molecular mass, mole, molar mass, atomic mass, formula mass and their relations; chemical equations and balancing chemical equations

**Lecture 9 (September 23):** Calculations of product/reactant amounts using balanced chemical equations, limiting reagents, and percent yields, Discussion on selective questions and problems on chapter 3

**Lecture 10 (September 25):** Exam I, Syllabus- Chapters 1 and 2

**Lecture 11 (September 30):** Terminologies related to solutions, electrolytes, non-electrolytes, precipitation reactions, writing balanced ionic equations, acid-base reactions; Homework 3 due

**Lecture 12 (October 2):** Oxidation numbers; oxidation-reduction reactions- types with examples; solution stoichiometry, concentration units, and gravimetric analysis; discussion on selective questions and problems on chapter 4, Homework 4 due

**Lecture 13 (October 7):** Physical properties of gases-relation between temperature, pressure, volume and amount of gases; Ideal gas law and its applications;

**Lecture 14 (October 9):** 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 of ideal gas law for real gases; Homework 5 due

**Lecture 15 (October 14):** Discussion on selective questions and problems on chapter 5

**Lecture 16 (October 16):** Exam II – Syllabus Chapters 4, 5 and most of 7

**Lecture 17 (October 21):** Properties of light, black-body radiation and photo-electric effect; atomic spectra and Bohr atomic theory

**Lecture 18 (October 23):** De Broglie equation, dual nature of particles, Schrodinger wave equation and orbital concept, electronic configuration-Aufbau principle, Hund's rule, paramagnetism

**Lecture 19 (October 28):** Discussion on selective questions and problems on chapter 7; Homework 6 due

**Lecture 20 (October 30):** Introductory discussion on periodic table, classification of elements, and electronic configuration of ions, periodic variation of properties of elements

**Lecture 21 (November 4):** Group properties of elements, discussion on selective questions and problems on chapter 8

**Lecture 22 (November 6):** Review on chapters 7 and 8; Homework 7 due

**Lecture 23 (November 11):** Exam III; Syllabus- Chapters 8 & 9

**Lecture 24 (November 13):** Basic concepts of chemical bonding, ionic bonds, lattice energy, and calculation of lattice energy, covalent bonds, polar covalent bonds and polarity

**Lecture 25 (November 18):** Lewis structures of molecules, formal charge calculation, Resonance structures and bond energy, discussion on selective questions and problems on chapter 9

**Lecture 26 (November 20):** Molecular geometry-Valence shell electron repulsion theory; Prediction of molecular geometry and polarity; Homework 8 due

**Lecture 27 (November 25):** Molecular geometry- Valence bond and molecular orbital theories, discussion on selective questions and problems on chapter 10

**Lecture 28 (December 2):** Review for Final Exam; Homework 9 due

**Final Exam (December 11):** 8:00am

**Students with Special Needs:** *Sul Ross State University is committed to equal access in compliance with the Americans With Disabilities Act of 1973. It is the student's responsibility to initiate a request for accessibility services. Students seeking accessibility services must contact Grace Petty in Counseling and Accessibility Services, Ferguson Hall, Room 112. The mailing address is P.O. Box C-171, Sul Ross State University, Alpine, Texas 79832. Telephone: 432-837-8203.*

**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.

