Sul Ross State University
Syllabus for General Chemistry I; CHEM 1311:01 (Spring 2019)

Class: General Chemistry I
Room: WSB 201
Time: TR 8:00-9:15am

Instructor: Dr. David Leaver
Office: WSB 318
Office Hours: M-R 3:00-5:00pm
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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: "General Chemistry, The Essential Concepts" 7th Edition, by Raymond Chang & Kenneth A. Goldsby 7th Edition, **2014** (or older editions), McGraw-Hill Publishing

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

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: There will be problems assigned for each chapter. **NO LATE HOMEWORK WILL BE ACCEPTED.** Homeworks must be completed in **PEN**!

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: 25%
Each Midterm Exam (16.67%): 50%
Final Exam: 25%

Midterm Exam I: Tuesday, February 26th
Midterm Exam II: Thursday, March 28th
Midterm Exam III: Thursday, April 25th
Final Exam: Wednesday, May 15th 8:00 am -10:00 am

Course Calendar

Lecture 1 (January 22): Discussion on syllabus, importance of chemistry

Lecture 2 (January 24): 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 (January 29): Precision and accuracy, Revision on Chapter 1

Lecture 4 (January 31): 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 (February 5): Molecules, compounds, ions, molecular formula and empirical formulas

Lecture 6 (February 7): Chemical nomenclature, naming of compounds, acids, bases, oxides, and oxoacids, Review on Chapter 2

Lecture 7 (February 12): Molecular mass, mole, molar mass, atomic mass, formula mass and their relations **(Homework 2 due)**

Lecture 8 (February 14): Chemical equations and balancing chemical equations, calculations of product/reactant amounts using balanced chemical equations, limiting reagents, and percent yields

Lecture 9 (February 19): Revision on Chapter 3, terminologies related to solutions, electrolytes, non-electrolytes, precipitation reactions (**Homework 3 due**)

Lecture 10 (February 21): Exam Revision

Lecture 11 (February 26): Exam I, Chapters 1,2 & 3

Lecture 12 (February 28): Writing balanced ionic equations, acid-base reactions; oxidation numbers; oxidation-reduction reactions- types with examples; solution stoichiometry, concentration units, and gravimetric analysis

Lecture 13 (March 5): Revision on Chapter 4, physical properties of gases-relation between temperature, pressure, volume and amount of gases

Lecture 14 (March 7): Ideal gas law and its applications, gas stoichiometry- calculation of reactant/product amounts in gaseous reactions using ideal gas equation (**Homework 4 due**)

Lecture 15 (March 12): Kinetic theory of ideal gases, deviation of deal gas, properties, modification of ideal gas law for real gases

Lecture 16 (March 14): Revision on Chapter 5, Properties of light, black-body radiation and photo-electric effect (**Homework 5 due**)

March 18-22nd is Spring Break (No classes)

Lecture 17 (March 26): Exam Revision on Chapters 4 and 5, Atomic spectra and Bohr atomic theory De Broglie equation, dual nature of particles,

Lecture 18 (March 28): Exam II, (Chapters 4 and 5)

Lecture 19 (April 2): Schrodinger wave, equation and orbital concept, electronic configuration-Aufbau principle, Hund's rule, paramagnetism

Lecture 20 (April 4): Review on Chapter 7, introductory discussion on periodic table (**Homework 6 Due**)

Lecture 21 (April 9): Classification of elements, and electronic configuration of ions, periodic variation of properties of elements, group properties of elements

Lecture 22 (April 11): Review on chapter 8; Basic concepts of chemical bonding, ionic bonds, lattice energy (**Homework 7 due**)

Lecture 23 (April 16): Calculation of lattice energy, covalent bonds, polar covalent bonds and polarity, Lewis structures of molecules,

Lecture 24 (April 18):, Formal charge calculation, resonance structures and bond energy; revision on Chapter 9 (**Homework 8 due**)

Lecture 25 (April 23): Exam Revision; Molecular geometry-Valence shell electron repulsion theory

Lecture 26 (April 25): Exam III (Chapters 7-9)

Lecture 27 (April 30): Molecular orbital theories, Revision on Chapter 10

Lecture 28 (May 2) Exam Revision, Chapters 1-4 (Homework 9 due)

Lecture 29 (May 7): Exam Revision, Chapters 5, 7-10

Final Exam Wednesday (May 15): At 8:00am-10:00 am (Comprehensive)

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 Mary Schwartze, M. Ed., L.P.C., in Counseling and Accessibility Services, Ferguson Hall, Room 112. The mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas 79832. Telephone: 432-837-8203. E-mail: mschwartze@sulross.edu.*

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. Electronic submission of homework is accepted after hours (not recommended), but must be hand written and scanned (either with a scanner or a smart phone) and emailed to Dr. Leaver at:* david.leaver@sulross.edu*. [.pdf is the preferred format for electronically submitted homework.] Homework electronically completed in Microsoft Word or similar programs will NOT be accepted.*