

Sul Ross State University
Syllabus for General Chemistry II: CHEM 1312 (Fall 2019)

Class: General Chemistry II
Room: WSB 307
Time: MWF 10:00-10:50 am

Instructor: Dr. David Leaver
Office: WSB 318
Office Hours: M-R 2:00-5:00pm
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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 II Learning Objectives:

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

1. The basic concepts of intermolecular forces
2. Physical properties of solutions
3. The basic concepts of chemical kinetics and equilibrium
4. The concepts of acid and bases
5. Laws of thermodynamics
6. Redox reactions

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 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:

Chapter 6: Energy Relationships in Chemical Reaction

Chapter 12: Intermolecular Forces and Liquids and Solids

Chapter 13: Physical Properties of Solutions

Chapter 14: Chemical Kinetics

Chapter 15: Chemical Equilibrium

Chapter 16: Acids and Bases

Chapter 17: Acid-Base Equilibria

Chapter 18: Laws of Thermodynamics

Chapter 19: Redox Reactions

Homework: There will be problems 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: Homeworks 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: 25%

Each Midterm Exam (16.67%): 50%

Final Exam: 25%

Midterm Exam I: Wednesday September 25th

Midterm Exam II: Wednesday October 16th

Midterm Exam III: Wednesday November 13th

Final Exam: Friday December 6th at 10:15 am – 12:15 pm

Course Calendar

Lecture 1 (August 26): Discussion on Syllabus. Importance of chemical energy and types of energy

Lecture 2 (August 28): Energy changes in chemical reactions, first law of thermodynamics and enthalpy of chemical reactions

Lecture 3 (August 30): Calorimetry, discussion on selective questions and problems on Chapter 6

September 2: NO CLASS: LABOR DAY HOLIDAY

Lecture 4 (September 4): Kinetic molecular theory of liquids and solids, types of intermolecular forces, properties of liquids, (*Homework Chapter 6 due*)

Lecture 5 (September 6): Crystal structure and bonding in solids, liquid-vapor equilibrium, and liquid-solid equilibrium

Lecture 6 (September 9): Phase diagrams, discussion on selective questions and problems on Chapter 12

Lecture 7 (September 11): Types of solutions and concentration units (*Homework Chapter 12 due*)

Lecture 8 (September 13): Factors affecting solubility and colligative properties

Lecture 9 (September 16): Discussion on selective questions and problems on Chapter 13

Lecture 10 (September 18): Terminologies related to rate laws (*Homework Chapter 13 due*)

Lecture 11 (September 20): First and second order reactions and experimental determinations of rate laws

Lecture 12 (September 23): Exam Revision

Lecture 13 (September 25): Exam I: Chapters 6, 12 & 13

Lecture 14 (September 27): Activation energy and temperature dependence of rate constants, elementary reactions

Lecture 15 (September 30): Catalysis, discussion on selective questions and problems on Chapter 14

Lecture 16 (October 2): The concepts of chemical equilibrium and equilibrium constants (*Homework Chapter 14 due*)

Lecture 17 (October 4): Reaction quotients, calculation of equilibrium concentrations, factors affecting chemical equilibrium,

Lecture 18 (October 7): Discussion on selective questions and problems on Chapter 15, concepts of acids and bases

Lecture 19 (October 9): Acid-base properties of water, pH, strength of acids and bases (*Homework chapter 15 due*)

Lecture 20 (October 11): Ionization constants of weak acids and bases, percent ionization, ionization constants of conjugate acids-bases

Lecture 21 (October 14): Exam Revision

Lecture 22 (October 16): Exam II: Chapters 14 & 15

Lecture 23 (October 18): Acid-base properties of salts, Lewis acids and bases, discussion on selective questions and problems on Chapter 16

Lecture 24 (October 21): Concept of buffer solution, preparing buffer with a specific pH, strong acid-strong base titrations (*Homework Chapter 16 due*)

Lecture 25 (October 23): Weak acid-strong base titrations, acid-base indicators, solubility product and molar solubility

Lecture 26 (October 25): Predicting precipitation reactions, common ion effect and solubility

Lecture 27 (October 28): Complex ion equilibria and solubility, discussion on selective questions and problems on Chapter 17

Lecture 28 (October 30): Spontaneous processes and entropy, second law of thermodynamics (*Homework Chapter 17 due*)

Lecture 29 (November 1): Gibbs free energy and chemical equilibrium

Lecture 30 (November 4): Discussion on selective questions and problems on Chapter 18

Lecture 31 (November 6): Redox reactions and balancing redox equations, (*Homework Chapter 18 due*)

Lecture 32 (November 8): Exam Revision

November 11: NO CLASS: VETERANS DAY HOLIDAY

Lecture 33 (November 13): Exam III: Chapters 16, 17 & 18

Lecture 34 (November 15): Galvanic cells

Lecture 35 (November 18): Standard reduction potentials and electromotive force (emf)

Lecture 36 (November 20): Nernst equation, concepts of batteries

Lecture 37 (November 22): Concepts of corrosion and electrolysis, discussion on selective questions and problems on Chapter 19

Lecture 38 (November 25): Discussion on selective questions and problems on Chapter 19 (*Homework Chapter 19 due*)

November 27-29: NO CLASS: THANKSGIVING HOLIDAY

Lecture 39 (December 2): Final Exam Revision (Chapters 6, 12-14)

Lecture 40 (December 4): Final Exam Revision (Chapters 15-18)

Final Exam (*Comprehensive*): Friday December 6th (10:15 am – 12:15 pm)

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 Schwartz, 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: mschwartz@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.*