

South Plains College
Common Course Syllabus: CHEM 1412
Revised July 2023

Department: Science

Discipline: Chemistry

Course Number: CHEM 1412

Course Title: General Chemistry II

Instructor:

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Office Hours: You may also make an appointment for office hours using the following link:

<https://calendly.com/lalexanderspc/summer-2023>

Available Formats: conventional

Campuses: Levelland

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. Basic laboratory experiments supporting theoretical principles presented in lecture; introduction of the scientific method, experimental design, chemical instrumentation, data collection and analysis, and preparation of laboratory reports.

Prerequisite: A grade of "C" or better in CHEM 1411.

Credit: 4 **Lecture:** 3 **Lab:** 3

Supplies:

Safety Goggles – Required, obtained from bookstore

Calculator – Required, must be scientific, **CELL PHONES NOT ALLOWED**

This course partially satisfies a Core Curriculum Requirement:

Life and Physical Sciences Foundational Component Area (030)

Core Curriculum Objectives addressed:

- **Communications skills**—to include effective written, oral and visual communication
- **Critical thinking skills**—to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information

- **Empirical and quantitative competency skills**—to manipulate and analyze numerical data or observable facts resulting in informed conclusions
- **Teamwork**—to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal

Student Learning Outcomes:

From Lecture:

1. Physical Properties of Solutions
 - a. Understand the definition of a solution and how a solution forms from a molecular point of view; to learn the different types of solutions
 - b. Learn the various methods of calculating the concentration of a solution and the corresponding units that go along with each method
 - c. Learn how temperature affects the solubilities of substances and how pressure affects the solubility of gases in solution
 - d. Understand the colligative properties of solutions and how to calculate changes in the freezing point and boiling point of a solution
2. Chemical Kinetics
 - a. Learn what the rate of a reaction means, how to determine it, and how to write the rate law for reactions
 - b. Understand the relation between reactant concentration and time, and how to calculate concentrations and times
 - c. Study the definition of activation energy and understand how rate constants are dependent on temperature
 - d. Discover how to determine a likely reaction mechanism
3. Chemical Equilibrium
 - a. Discover what chemical equilibrium is and study how to write an equilibrium expression using the law of mass action
 - b. Study about homogeneous and heterogeneous equilibria and how these affect the equilibrium expression
 - c. Discover the difference between the equilibrium constant and the reaction quotient and how these are used to predict the direction a reaction will proceed to reach equilibrium
 - d. Calculate the equilibrium constant using given equilibrium concentrations and calculate equilibrium concentrations given the equilibrium constant
 - e. Learn what factors affect equilibrium
4. Acids and Bases
 - a. Discover the Bronsted-Lowry and Arrhenius definitions of acids and bases as well as how to determine which compound is the acid or base
 - b. Learn the acid-base properties of water and how the ion-product constant of water is determined and used
 - c. Study pH and how it is calculated
 - d. Distinguish between strong acids/bases and weak acids/bases and learn how to calculate the pH of these acids and bases using ionization constants when necessary
 - e. Understand the acid-base properties of salts and how to calculate the pH of a salt solution
5. Acid-Base Equilibria and Solubility Equilibria

- a. Learn about the common ion effect and how the Henderson-Hasselbalch equation can be used to calculate the pH of solutions that have a common ion
 - b. Discover buffers including their definition, calculation of their pH, and the preparation of one
 - c. Study about acid-base titrations and the calculation of pH at different points during a titration as well as learning about indicators that can be used during a titration
 - d. Understand solubility equilibria and distinguish between solubility and molar solubility
 - e. Perform calculations involving the solubility product constant and study how the common ion effect affects solubility
6. Thermodynamics
- a. Discover what a spontaneous process is
 - b. Learn about entropy including the second and third law of thermodynamics and to perform entropy calculations
 - c. Understand the meaning of Gibbs Free Energy, perform Gibbs Free Energy calculations and to learn how the free energy change affects spontaneity
 - d. Discover how free energy and chemical equilibrium are related
7. Electrochemistry
- a. Learn about redox reactions and how to balance them using the half-reaction method
 - b. Learn about voltaic cells and how to write cell diagrams
 - c. Study about standard reduction potentials including their use in calculating cell voltages
 - d. Explore the spontaneity of redox reactions and how standard cell voltages, equilibrium constants, and standard free energy changes are related
 - e. Understand what affect concentration has on cell voltage and perform related calculations
 - f. Study about corrosion
8. Nuclear Chemistry
- a. Distinguish between nuclear and chemical reactions
 - b. Study the types of particles involved in nuclear reactions as well as how to use them to balance nuclear reactions
 - c. Study about nuclear stability and how this affects radioactive decay
 - d. Learn about natural radioactivity and the kinetics of these processes
 - e. Distinguish between nuclear transmutation, nuclear fission, and nuclear fusion

From Lab:

1. Safety Orientation
 - a. Demonstrate the fundamentals of laboratory safety including the use and location of safety equipment
2. Calculations involving solutions
 - a. Demonstrate knowledge of calculations involving solutions
3. Freezing point depression

- a. Perform or view a demonstration of a freezing point depression experiment including calculations of molar mass with data collected
4. Molar mass by the boiling point method
 - a. Perform or view a demonstration of an experiment that uses boiling point elevation data to determine molar mass
5. Kinetics
 - a. Perform or view a demonstration of an experiment that employs the use of spectrometer data to determine the order of a reaction
6. Acids and Bases
 - a. Demonstrate knowledge of acids and bases by calculation of their pH's
7. Weak acid ionization constant
 - a. Perform or view a demonstration of an experiment that uses titration data collected from pH meters to calculate the ionization constant of a weak acid
8. Common ion effect
 - a. Perform or view a demonstration of an experiment that uses titration data to prove the common ion effect

Student Learning Outcomes Assessment: 2-3 questions from each semester will be randomly selected from the regular exams. These will pertain to a pre-selected topic and will be used to determine the extent of improvement that the students have gained during the semester.

- **Minimum Computer Requirements:**
 - 1. Person computer with Pentium processor with at least 32 MB of memory, a minimum 2 GB hard drive, running Windows 95 or later (Windows XP or better is preferred) or an updated Mac IOS.
 - 2. Web Browser: Google Chrome is most compatible with MasteringChemistry, however firefox or safari will work. Please do not use Internet Explorer.
 - 3. A high speed internet connection
 - 4. Microsoft Office and Microsoft PowerPoint and Word software (a recent version, preferably 2003 or higher).
 - 5. Windows Media Player (the latest version) or other updated Media Player
 - 6. Soundcard and/or functioning speakers
 - 7. Knowledge of how to navigate Google Chrome web pages and how to deal with pop-up blockers and other devices and warnings on Google Chrome.
 - 8. Knowledge of how to download files from the web browser and find them on your computer once they are downloaded.
 - 9. Knowledge of basic operations of Microsoft Word, PowerPoint, and Excel.
 - 10. Knowledge of how to view and adjust videos within a Media Player.
 - 11. Webcam: all exams will be remotely proctored
- **Computer Problems or Blackboard Server Problems**
 - If a student's internet connection goes down, or a student's computer crashes or otherwise becomes inoperable for blackboard, it is the responsibility of the student to have their internet connection and/or computer repaired as soon as possible in order to avoid getting behind in the class. While the computer and/or internet connection is being repaired, the student should seek an alternate computer. There are computer labs on both the Levelland and Reese campuses. Internet problems and/or the crash or inoperability of a computer will not be an acceptable excuse for being late with assignments or exams. It is

the responsibility of the student to have a backup plan in place. If the blackboard server goes down, the appropriate time extensions will be determined and announced by the instructor.

Course Evaluation:

- **Four Major Exams**
 - NO MAKEUPS
 - All Multiple Choice questions
 - Each Exam is worth 100 points with the possibility of bonus points
 - Calculators will have their memory cleared and proof of memory clearing must be shown to the instructor before the Exam can be started

- **Notecards**
 - A 3X5 notecard will be permitted for Exams 1-4 Both sides of the notecard may be used and maybe handwritten or typed. Notecards should contain formulas, definitions, and constants, or any other information allowed by the instructor announced in class. Notecards CAN NOT contain any worked examples from class notes, in-class worksheets, practice problems, or any other examples found online. A student should also not write any questions on the notecard.

 - For each unauthorized example found on the notecard points will be deducted from the exam. The length of the exam and the amount of unpermitted information will determine the number of points deducted. Any bonus points for that exam will also be deducted from the exam total. Any unauthorized material on the notecard is classified as cheating therefore the cheating policies in the syllabus will also be followed.

- **Lab Worksheets, Experiments**
 - **A student will NOT be able to enter the lab without the proper attire (closed toed shoes, long pants, shirts with sleeves, long hair pulled back, and safety goggles). A student that is not dressed appropriately for lab will not be able to perform the experiment and therefore will receive a 0 for that Lab Worksheet.**
 - Lab Worksheet
 - Each Lab Worksheet must be filled out during the Experiment and turned in before the student leaves the lab
 - Each lab group will turn in 1 Lab Worksheet with all group members name on it, all members will receive the same grade
 - Each Lab Worksheet is worth 100 points.
 - Experiments
 - Lab Worksheet is what makes up the student's grade for that Experiment.
 - A missed Lab results in a **0** for the Lab Worksheet.
 - Make-Ups for missed Lab Experiments are **NOT** allowed.

- **Chapter Homework**

- Each chapter will have a homework section. These will be turned in one to two class days after the chapter material has been finished. The date will be announced on the syllabus and on Blackboard.
- **Dropped Grades**
 - Lowest two Grades Dropped
 - At the end of the semester the Instructor will automatically drop the lowest two grades from the total of the lab and homework. The lowest TWO grades will be dropped.
- **Cell Phone and Laptop Computer Policy**
 - Cell Phones and Laptops may be taken up and kept during lecture and lab if they are a distraction to the student, the instructor or the class
 - The only exception will be due to Special Services recommendations and those will be handled on an individual student to student basis
- **Grading:**
 - Exams are 70%
 - Homework and Labs combined are 30%

Plagiarism and Cheating: Students are expected to do their own work on all projects, quizzes, assignments, examinations, and papers. Failure to comply with this policy will result in an F for the assignment and can result in an F for the course if circumstances warrant. If a student is caught cheating on any of the Major Exams they will receive a 0 for that Exam and be the Final Exam will **NOT** replace the lowest Exam score (the 0 stands and cannot be replaced)

Plagiarism violations include, but are not limited to, the following:

1. Turning in a paper that has been purchased, borrowed, or downloaded from another student, an online term paper site, or a mail order term paper mill;
2. Cutting and pasting together information from books, articles, other papers, or online sites without providing proper documentation;
3. Using direct quotations (three or more words) from a source without showing them to be direct quotations and citing them; or
4. Missing in-text citations.

Cheating violations include, but are not limited to, the following:

1. Obtaining an examination by stealing or collusion;
2. Discovering the content of an examination before it is given;
3. Using an unauthorized source of information (notes, textbook, text messaging, internet, apps) during an examination, quiz, or homework assignment;
4. Entering an office or building to obtain unfair advantage;
5. Taking an examination for another;
6. Altering grade records;
7. Copying another's work during an examination or on a homework assignment;
8. Rewriting another student's work in Peer Editing so that the writing is no longer the original student's;

9. Taking pictures of a test, test answers, or someone else's paper.

4.0 INSTRUCTIONAL POLICIES AND RESPONSIBILITIES

For information regarding official South Plains College statements about intellectual exchange, disabilities, non-discrimination, Title IX Pregnancy Accommodations, CARE Team, and Campus Concealed Carry, please

visit <https://www.southplainscollege.edu/syllabusstatements/>.