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Chemistry (CHEM) 1510 Introductory College Chemistry (4 Units) CSU:UC
[formerly Chemistry 10]

Prerequisite: Eligibility for Mathematics 1060

Advisory: Eligibility for English 1500

Prerequisite knowledge/skills: Before entering the course the student should be able to

1. use inequality symbols and exponents, and apply order of operations rules in complex calculations,
2. identify numbers as belonging to specified sets, such as rational numbers, and graph numbers on the real number line,
3. perform the basic arithmetic operations with positive and negative real numbers, using the number line to clarify addition and subtraction processes,
4. know the properties of addition and multiplication for real numbers and identify their use in practice,
5. solve linear equations and inequalities in one variable, and analyze and solve word problems leading to linear equations,
6. solve formulas for specified variables and use the resulting equations in solving word problems,
7. set up and solve problems involving the use of ratios and proportions,
8. know and apply the rules of exponents using integral exponents, and use scientific notation,
9. perform addition, subtraction, multiplication and division of polynomials,
10. factor simple polynomials, with special emphasis on trinomials quadratic in form and special factorizations, and solve related polynomial equations,
11. analyze and solve word problems requiring the setting up and solution of factorable quadratic equations,
12. graph points representing specified ordered pairs using a standard two dimensional rectangular coordinate systems. Graph a straight line from ordered pairs obtained from its equation,
13. determine the slope of a line between any specified pair of points,
14. know the slope-intercept and point-slope forms of the equation of a straight line, and be able to determine the equation of a particular straight line from specified input information,
15. solve and graph linear inequalities in two variables,
16. solve linear systems of equations in two variables both graphically and algebraically, and recognize inconsistent and dependent systems,
17. analyze and solve word problems requiring the use of linear systems of equations in two variables,
18. solve linear systems of inequalities in two variables graphically, and
19. find the value of integral roots of positive real numbers.

Total Hours: 48 hours lecture; 48 hours lab (96 hours total)

Catalog Description: This course is a survey of basic chemistry topics. This course is intended as preparation



for chemistry and allied health majors, and general education. This is a general education course not open to students with credit in Chemistry 2211. C-ID: CHEM 101.

Type of Class/Course: Degree Credit

Lecture Text: Zumdahl, Steven S. and Donald J. DeCoste. *Introductory Chemistry: A Foundation*. 6th Ed. Boston: Cengage, 2011. Print.

Lab Text: Seger, Spencer L. and M. R. Slabaugh. *Safety Scale Lab Experiments*. 7th ed. Cengage, 2012. Print.

Course Objectives:

By the end of the course, a successful student will be able to

1. Analyze the fundamental features of chemistry including measurement, mathematical conversion of measured physical properties such as mass, volume, density, pressure, temperature, solutions, concentrations and dilutions,
2. Demonstrate knowledge of the qualitative features of chemistry including physical and chemical properties, naming and writing chemical formulas of compounds and evaluating chemical reactions,
3. Differentiate typical acid and base formulas and compare/contrast the behavior associated with acids and bases, and
4. Analyze chemical reactions to quantitatively determine theoretical yield

Course Level Student Learning Outcomes

Local General Education Learning Outcomes

1. Develop an understanding of the relationship between science and other human behaviors.
2. Demonstrate the scientific method.

Course Scope and Content: (Lecture)

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|----------|-------------------------------------|
| Unit I | Matter – Atoms and Elements |
| | A. Atomic Theory |
| | B. Isotopes |
| | C. Electron Configurations |
| | D. Periodic Trends |
| | E. Chemical and Physical Properties |
| Unit II | Nomenclature |
| | A. Ionic Compounds |
| | B. Covalent Compounds |
| | C. Chemical Formulas |
| | D. Acids and Bases |
| Unit III | Measurement |
| | A. Uncertainty in Measurement |
| | B. Units of Measurement |

- C. Dimensional Analysis
- D. Significant Figures and Calculations

- Unit IV Chemical Bonds
- A. Types of Bonds
 - B. Electronegativity and Bond Polarity
 - C. Lewis Structures
 - D. Molecular Geometry
- Unit V Chemical Reactions
- A. Chemical Change
 - B. Chemical Equations
 - C. Classifying Chemical Reactions
 - D. Kinetics
 - E. Equilibria
- Unit VI Stoichiometry
- A. Molar Mass
 - B. Mole to Mole Relationships
 - C. Limiting Reactant
 - D. Theoretical Yield
- Unit VII Energy and States of Matter
- A. Temperature and Heat
 - B. Phase Changes
 - C. Thermodynamics
 - D. Intermolecular Forces
- Unit VIII Gas Laws
- A. Properties of Gases
 - B. Gas Law Concepts
 - C. Gas Stoichiometry
 - D. Kinetic Molecular Theory
- Unit IX Aqueous Systems
- A. Intermolecular Forces
 - B. Solubility
 - C. Electrolytes
 - D. Equilibria
- Unit X Solutions
- A. Concentration
 - B. Preparation
 - C. Dilution
 - D. Solution Stoichiometry
- Unit XI Acid, bases and salts
- A. Properties
 - B. Strength
 - C. pH
 - D. Buffers

E. Equilibria

Course Scope and Content: (Laboratory)

The laboratory component of this course provides hands-on practical experience with introductory chemistry. Laboratory exercises are designed to familiarize students with common equipment, instrumentation and techniques as they qualitatively and quantitatively explore and expand on principles presented in lecture.

Unit I Introduction to the Chemistry Laboratory
A. Safety
B. Measurement and Calculations
C. Laboratory Equipment and Instrumentation

Unit II Qualitative Analysis
A. Chromatography
B. Ion Identification
C. Classification of Electrolytes
D. Classification of Chemical Reactions
E. Equilibria Manipulation
F. Acids and Bases

Unit III Quantitative Analysis
A. Density Determination
B. Gravimetric Analysis
C. Volumetric Analysis
D. Gas Laws
E. Kinetics
F. pH Buffers

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 6 hours per week outside of the regular class time doing the following:

1. Studying text, chapter handouts and learning objectives.
2. Answering questions
3. Skill practice
4. Completing required reading
5. Problem solving activity or exercise
6. Written work

Methods of Instruction:

1. Assign reading topics in the textbook and in the reference books present in our library.
2. Class lectures will be used to clarify and extend the theoretical and factual concepts present in the text.
3. Audiovisual materials, relative to some unit of study will be shown to supplement lecture materials.
4. Problem sets and questions from the text will be assigned.
5. Selected experiments will be assigned in the laboratory for individual student learning.
6. Demonstration experiments and lecture demonstrations will be used in the classroom and laboratory.

Methods of Evaluation:

1. Substantial writing assignments including:
 - a. Essay Exams
 - b. Laboratory reports
 - c. Research reports

2. Computational or non-computational problem-solving demonstrations including:
 - a. Exams
 - b. Homework problems
 - c. Quizzes
 - d. Laboratory reports

3. Other examinations, including:
 - a. Multiple choice
 - b. Matching items
 - c. True/false items
 - d. Completion

Laboratory Category: Extensive Laboratory

Pre delivery criteria: All of the following criteria are met by this lab.

1. Curriculum development for each lab
2. Published schedule of individual laboratory activities
3. Published laboratory activity objectives
4. Published methods of evaluation
5. Supervision of equipment maintenance, laboratory setup, and acquisition of lab materials and supplies

During laboratory activity of the laboratory: All of the following criteria are met by this lab

1. Instructor is physically present in lab when students are performing lab activities
2. Instructor is responsible for active facilitation of laboratory learning
3. Instructor is responsible for active delivery of curriculum
4. Instructor is required for safety and mentoring of lab activities
5. Instructor is responsible for presentation of significant evaluation

Post laboratory activity of the laboratory: All of the following criteria are met by this lab.

1. Instructor is responsible for personal evaluation of significant student outcomes (lab exercise practicals, notebooks, portfolios, etc.) that become a component of the student grade that cover the majority of lab exercises performed during the course
2. Instructor is responsible for supervision of laboratory clean-up of equipment and materials.

Supplemental Data:

TOP Code:	190500 Chemistry
SAM Priority Code:	E: Non-Occupational

Funding Agency:	Y: Not Applicable
Program Status:	I: Program Applicable
Noncredit Category:	Y: Not Applicable
Special Class Status:	N: Course is not a special class
Basic Skills Status:	N: Not Applicable
Prior to College Level:	Y: Not Applicable
Cooperative Work Experience:	N: Course is not a part of a cooperative education program
Eligible for Credit by Exam:	No
Eligible for Pass/No Pass:	Yes