CHEM 110: BEGINNING GENERAL CHEMISTRY

Citrus College Course Outline of Record

Heading	Value
Effective Term:	Fall 2024
Credits:	5
Total Contact Hours:	180
Lecture Hours :	54
Lab Hours:	126
Hours Arranged:	0
Outside of Class Hours:	108
Total Student Learning Hours:	288
Prerequisite:	Intermediate algebra or higher or direct placement based on multiple measures.
Strongly Recommended:	ENGL 101.
District General Education:	B2. Natural Sciences - Physical Sciences, B3. Natural Sciences - Laboratory
Transferable to CSU:	Yes
Transferable to UC:	Yes - Approved
Grading Method:	Standard Letter, Pass/No Pass

Catalog Course Description

An introductory course in the fundamental principles of chemistry. Topics covered are those necessary for understanding chemical structure and reactivity, and for scientific calculations. There is an emphasis on laboratory work and communication skills. The course is designed for science and engineering majors, pre-medical students, and as a general education class. 54 lecture hours, 126 lab hours.

Course Objectives

- Recognize and discuss precision and accuracy pertaining to data and calculations.
- Convert measurable quantities such as mass and volume into chemical quantities (the mol).
- Calculate percent composition of a compound or use percent composition to calculate a chemical formula.
- Recognize specific types of reactions such as redox, acid-base and precipitation.
- Properly balance chemical reactions.
- Calculate experimental, theoretical and percent yields of reactions.
- Calculate yields based on limiting reagents.
- Understand simple behaviors of gases and correctly apply the ideal and empirical gas laws.
- Do computations using concentrations of solutions such as dilution, molarity, and stoichiometry.
- Recognize acids and bases, the strength of an acid, presence of buffers, and be able calculate pH of a solution in calculations.
- Describe chemical equilibrium and Le Chatelier's principle.
- Appreciate the significance of uncertainty and significant figures in data and calculations.
- Use equilibrium expressions to calculate concentrations and predict which way a chemical reaction will go.
- Create useful conversion factors from standard units, densities, percentages, and chemical relationships.
- Use specific heats and enthalpies of phase changes to calculate thermodynamic results.
- Draw and interpret heating/cooling curves from appropriate data.
- Describe the structure of atoms.
- Describe the electron configuration and Lewis structures of atoms and ions, and be able to describe trends such as size and ionization energy.
- Draw Lewis structures of molecules and ions and use VSEPR to predict properties of those molecules.
- Categorize compounds as ionic, covalent, organic or acids, and name them appropriately.

Major Course Content

1. Units/Dimensional Analysis
2. Matter and Energy/Atomic Theory
3. Atomic Structure/Periodicity
4. Chemical Formulas/Nomenclature
5. Mole Concept/Chemical Composition
6. Balancing Equations
7. Types of Chemical Reactions/Redox
8. Stoichiometry
9. Chemical Bonding
10. Molecular Structure
11. Gas Laws
12. Condensed Phases/Intermolecular Forces
13. Solutions
14. Acids and Bases
15. Chemical Equilibrium

Lab Content

1. Measurements and Uncertainty/Dimensional Analysis (problem set)
2. Density Determination (experiment/report)
3. Separation of Components of Mixture (experiment/report)
4. Calorimetry (experiment/report)
5. Flame Tests (experiment/report)
6. Atomic Structure and Spectra (problem set)
7. Chemical Nomenclature (problem set)
8. Mole Calculations (problem set)
9. Percent Composition (experiment/report)
10. Types of Reactions (experiment/report)
11. Solubility of Ionic Compounds (experiment/report)
12. Chemical Synthesis (experiment/report)
13. Molecular Modeling (dry lab)
14. Collection of Gas over Water (experiment/report)
15. Gas Laws (problem set)
16. Quantitative Analysis (experiment/report)
17. Acid-base Titration (experiment/report)
18. Acid-base Calculations (problem set)

Suggested Reading Other Than Required Textbook

No other required materials.

Examples of Required Writing Assignments

There is considerable writing out of homework. Much of the homework is computational, but some involves detailed explanation of concepts such as, for example, explaining ionization energy trends, or similarities and differences between static systems and systems in a state of dynamic equilibrium, or in articulating the development of chemical concepts such as the evolution of the modern atomic model from the experiments of Thomson, Rutherford, Balmer, Bohr and others. Properly addressing these topics would typically require one or two well crafted paragraphs. Additionally, weekly lab reports of between 2 and 5 pages will often require time outside of class to produce work reasonably free of spelling and grammatical errors. As part of the lab reports, students are required to field post-laboratory questions that address mastery of the concepts and some analysis of the experimental results. Students are required to articulate interpretation of scientific data and results in a manner appropriate to their level of understanding.

Examples of Outside Assignments

Each student will have his/her own specific needs, but homework is selected to develop and assess mastery of foundational math and comfort level using "dimensional analysis" to solve a wide range of problems, to reinforce the memorization of nomenclature of chemical compounds and equations, and to help master specific chemical concepts such balancing reaction, calculating limiting reactants, etc.

Instruction Type(s)

Lab, Lecture, Online Education Lab, Online Education Lecture

IGETC Area 5: Physical and Biological Sciences

5A. Physical Science, 5C. Science Laboratory