



Syllabus

CHM 121 General Chemistry I

General Information

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Course Prefix CHM

Course Number 121

Course Title General Chemistry I

Course Information

Catalog Description The first semester of a comprehensive two-semester general chemistry course. General principles of chemistry are introduced, including atomic structure, the periodic table, chemical calculations, classification of chemical reactions, nomenclature, kinetic theory of gases, ionic and covalent bonding, liquids and intermolecular forces to provide a thorough treatment of chemical principles. The course includes both laboratory and lecture. (CHM 092 or high school chemistry is strongly recommended)

Credit Hours 4

Lecture Contact Hours 3

Lab Contact Hours 3

Other Contact Hours 0

Grading Scheme Letter

Prerequisites

Placement into Math Level 2 or higher or MAT 097.

Co-requisites

None

First Year Experience/Capstone Designation

This course DOES NOT satisfy the outcomes applicable for status as a FYE or Capstone.

SUNY General Education

This course is designated as satisfying a requirement in the following SUNY Gen Ed category

Natural Sciences (and Scientific Reasoning)

FLCC Values

Institutional Learning Outcomes Addressed by the Course

Inquiry and Interconnectedness

Course Learning Outcomes

Course Learning Outcomes

1. Explain and apply the fundamental concepts of chemical and physical properties of matter.
2. Analyze and interpret data in order to solve chemical problems.
3. Utilize fundamental laboratory techniques safely and proficiently.

Outline of Topics Covered

Introduction to Chemistry

- The student should be able to demonstrate an understanding of the nature of chemistry; the classification, properties, and types of changes of matter
- Be able to differentiate between pure substances and mixtures, and to understand terms such as elements, compounds, atoms, molecules, homogeneous, heterogeneous, phases and solutions
- Understand chemical symbols and formulas, and the type of information they convey
- Differentiate between chemical and physical properties and changes
- Understand scientific notation and significant figures
- Identify the common Metric/SI units for mass, length, volume, and energy and the prefixes from mega- through pico-
- Interconvert temperatures among Celsius, Fahrenheit and Kelvin scales

Early Atomic Structure and Periodicity

- The student should be able to demonstrate an understanding of the historical development of the atomic models of the atom (Dalton, Thomson, Rutherford)
- Describe the structure and components of atoms and apply these concepts to the information contained in the Periodic Table, as well as understand the classical experiments that lead to the present day models

- Classify elements in the Periodic Table as metals, non-metals, or metalloids, and list the general properties of these classifications
- Understand the Laws of Definite and Multiple Proportions
- Explain the basis of the atomic mass

Chemical Calculations (Stoichiometry)

- The student should be able to demonstrate an understanding of the mole concept, and do calculations involving formulas and balanced equations
- Interconvert between the mass, moles, molar concentration, and numbers of atoms or molecules in a chemical substance
- Calculate the percent composition of a compound from its formula
- Calculate the empirical and molecular formula of a compound
- Balance chemical equations
- Use the mole concept to calculate quantities of reactants and/or products involved in a balanced equation when the amount of one or more substances is given
- Identify limiting and excess reagents and determine percent yields

Classification of Chemical Reactions, Net Ionic Equations, Solubility Tables, and Nomenclature

- The student should be able to demonstrate an understanding of the properties, definitions and reactions of acids, bases and salts
- Define the terms strong and weak electrolytes and non-electrolytes
- Understand Arrhenius and Bronsted-Lowry definitions of acids and bases
- Use solubility rules to determine if a specific compound is soluble in water
- Predict products of double displacement reactions and write balanced ionic equations
- Write the names and formulas for common ionic and covalent compounds

The Gaseous State

- The student should be able to describe properties and behavior of gases using Boyle's, Charles and Avogadro's Laws
- Differentiate between ideal and non-ideal gas behavior through the application of the ideal gas law and the van der Waals equation
- Perform stoichiometric calculations of gaseous reactants and products
- Derive the gas law constant (R)
- Understand the kinetic-molecular theory of gases
- Do calculations using Dalton's Law of partial pressures

The Quantum Mechanical Model of the Atom, Electron Configuration & Periodicity

- The student should be able to explain Blackbody radiation, photoelectric effect, the spectra of the Hydrogen atom, and the concept of wave-particle duality
- Identify the regions of the electromagnetic spectrum and perform calculations involving frequency, wavelength and energy
- Define the four quantum numbers and relate them to electronic structure

- State Pauli's exclusion principle and write the ground state electronic configurations following the Aufbau principle and Hund's Rule
- Know the Periodic Trends
- Define Ionization Energy, Electron Affinity, electronegativity
- Describe characteristic properties of Alkali metals, Halogens and Noble gases

Principles of Ionic and Covalent Bonding

- The student should be able to recognize the difference between ionic and covalent bonding models
- Draw Lewis structures for atoms, ion, and molecules using the octet rule
- Be able to calculate formal charges
- Draw resonance contributing forms and hybrid structures where applicable
- Predict the presence and direction of dipoles in polar covalent molecules
- Use the valence shell electron pair repulsion theory (VSEPR) to predict shapes of molecules from molecular formulas

Liquids and Intermolecular Forces

- The student should be able to demonstrate an understanding of the properties of liquids
- List the various intermolecular attractions in liquids and solids and describe their relative strengths
- Describe how hydrogen bonding explains the unique properties of water
- Explain the energy changes associated with changes in state
- Describe the relationships among temperature, vapor pressure and boiling point