

# CHEM 111: GENERAL CHEMISTRY I

## 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; CHEM 110 or passing score on Chemistry Placement Test.
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

A general course in the fundamental principles of chemistry. Topics covered include periodicity, stoichiometry, nomenclature, atomic structure, bonding, chemical calculations, thermodynamics, intermolecular forces, gases, materials and nanotechnology, and organic chemistry. The course is designed for all science and engineering majors and pre-medical students. 54 lecture hours, 126 lab hours.

## Course Objectives

- demonstrate knowledge of the SI system of units by solving complex unit conversions
- describe the nature of acids and bases. Be able to solve problems involving titrations
- draw the structure of a number of organic compounds
- write the name of a number of organic compounds
- perform in the laboratory a variety of experiments using common chemical laboratory equipment
- use the computer in a number of activities, including writing up lab reports, using graphical and data verification software
- solve multi-step weight-weight problems
- solve other stoichiometric problems including percent composition and simplest formula problems
- write the electron configuration and the quantum number description of most elements in the Periodic Table
- describe the bonding in ionic and covalent compounds. Write the VSEPR structure for a number of selected compounds
- write the formulas and names of inorganic compounds
- solve problems involving concentration of solutions

- solve problems involving the Gas Laws. Be able to manipulate  $PV=nRT$  in a variety of Gas Law problems
- describe the unit cell structure of a selected number of substances
- describe properties of simple nanostructures
- recognize the importance of how structure influences the bulk properties of materials

## Major Course Content

1. Introduction. Measurements, Units, Density, Specific Heat
2. Laws of Chemistry. Chemical Laws, Atomic Weight, Molecular Weight
3. Chemical Mathematics. Mole Concept, Weight-Weight Problems, Percent Composition, Simple Formula, Naming of Compounds
4. Atomic Structure. Periodic Table, Bohr Atom, Spectra, s, p, d, f Orbitals, Quantum Numbers
5. Chemical Bonding, Hybridization, Lewis Structures, Resonance
6. Molecular Structure, VSEPR Theory, Molecular Orbital Theory
7. Acids and Bases, Solutions, Oxidation-Reduction Reactions, Balancing, Activity Series, Net Ionic Equations
8. Gas Laws. Ideal Gas Law, Van de Waals Equation, Gas Problems, Real Gases
9. Solids, Liquids, Change of State Phase Diagrams, Nanoscience, Materials
10. Solutions, Concentration, Colligative Properties, Distillation
11. Organic Chemistry

## Lab Content

1. Uncertainty in Measurements and Calculations (Problem Set)
2. Determination of Water in a Hydrated Salt (Lab)
3. Determination of Dissolved Solids in Water (Lab)
4. Determination of the Limiting Reactant (Lab)
5. Volumetric Analysis (Lab)
6. Analysis of Bleach (Lab)
7. Non-Ideal Gases (Problem Set)
8. Heats of Combustion (Problems Set)
9. Molar Mass of a Volatile Liquid (Lab)
10. Applications of Algebra (Problem Set)
11. Periodicity and Atomic Structure (Problem Set)
12. Spectroscopy (Lab)
13. Chromatography (Lab)
14. Molecular Geometry (Lab and Problem Set)
15. Organic molecules (Problem Set)
16. Aspirin Synthesis (Lab)
17. Molar Mass by Colligative Properties
18. Materials and Nanoscience (Problem Set)

## Suggested Reading Other Than Required Textbook

Directed readings from mass media (web, newspapers) highlighting the relevance of the course.

## **Examples of Required Writing Assignments**

Write weekly lab reports based on in lab experiments and occasional essays linking current events to course material.

## **Examples of Outside Assignments**

Extensive problem solving from the textbook and problems sets.

For example: Given defined amounts of reagents, a theoretical yield of product will be calculated.

Ionization energies of the elements will be analyzed and plotted, and trends will be explained with modern atomic theory.

## **Instruction Type(s)**

Lab, Lecture, Online Education Lab, Online Education Lecture

## **IGETC Area 5: Physical and Biological Sciences**

5A. Physical Science, 5C. Science Laboratory