

Kenneth P. Dietrich School of Arts and Sciences  
**College in High School**

2023-2024  
**General Chemistry 1**  
CHEM 0110--4 Credits

**Description:** This is the first half of a two-term introduction to general chemistry. Topics covered include stoichiometry, atomic and molecular structure, and states of matter. Problem solving and laboratory experiences are a functional part of this course.

**Prerequisite:** High school chemistry is a prerequisite for the course.

**Grading:** The grade is determined by the student's performance on three exams, weekly quizzes, laboratory exercises, and a comprehensive final.

**Textbook:** The recommended text for this course is *General Chemistry* – 9<sup>th</sup> ed. or later, by Ebbing and Gammon; Houghton/Mifflin Publishing, now Cengage.

**Laboratory:** Laboratory exercises are conducted at the University by the Director of Freshman Laboratories and his staff of graduate teaching assistants. If a student misses a laboratory exercise at the University of Pittsburgh, it is their responsibility to make it up. If the student does not make it up, they will receive a grade of zero for the lab.

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**The following topics are covered in the University of Pittsburgh Chemistry 0110 course:**

**1. Background**

- Significant figures
- Scientific notation
- SI units of measurement
- Algebra, unit analysis

**2. Atomic Theory**

- The atom
- Periodic Table
- Oxidation states
- Mole conversions
- Molecular and ionic compounds
- Nomenclature

**3. Chemical Formulas**

- Balancing Reactions
- MW & % Composition
- Empirical and molecular formulas

- Conservation of Mass
- Combustion Analysis

**4. Calculations**

- Classes of Reactions
- Net Ionic Equations
- Precipitation, gas-driven, and acid-base reactions
- Activity series of metals
- Molarity
- Limiting reagent/theoretical yield/% yield

**EXAM I (1 hour)**

**5. Quantum Theory**

- Properties of Light
- Quantum theory and orbitals

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- Quantum numbers

### 6. Periodic Table and Trends

- Electron configurations
- Hund's Rule/Pauli Exclusion Principle
- Atomic and ionic size
- Effective Nuclear Charge, Ionization energy, electron affinity/electronegativity

### 7. Bonding

- Ionic vs. covalent bonds
- Lattice energy and Coulomb's Law
- Bond Polarity
- Formal Charge
- Lewis Structures
- Bond Length/Bond Strength

### 8. Bonding Theories

- VSEPR
- Hybridization
- Polarity of a molecular
- Bond angles and bond compression
- Molecular orbital diagrams

### EXAM II (1 hour)

### 9. Gases

- Volume, pressure and temperature
- Boyle's Law, Charles's Law
- Avogadro's Law
- Ideal gas law
- Gas density and mixtures

- Kinetic-molecular theory
- Diffusion, effusion
- Graham's Law
- Van der Waal's equation
- Collecting a gas over water

### 10. Thermochemistry

- Energy flow, heat and work
- Enthalpy changes and heats of reaction
- Calorimetry
- Hess's Law
- Enthalpy of Formation
- Bond Enthalpies

### EXAM III (1 hour)

### 11. States of Matter

- Intermolecular Forces
- Phase changes
- Phase diagrams
- Surface Tension and Viscosity

### 12. Solutions

- The Solution Process
- Temperature, Pressure, and Solubility
- Colligative Properties
- Vapor Pressure
- Osmosis

### CUMULATIVE FINAL EXAM (2 Hours)

**Academic Integrity:** All College in High School teachers, students, and their parents/guardians are required to review and be familiar with the University of Pittsburgh's Academic Integrity Policy located online at <https://www.as.pitt.edu/faculty/policies-and-procedures/academic-integrity-code>.

**Grades:** Grade criteria in the high school course may differ slightly from University of Pittsburgh standards. A CHS student could receive two course grades: one for high school and one for the University transcript. In most cases the grades are the same. These grading standards are explained at the beginning of each course.

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**Transfer Credit:** University of Pittsburgh grades earned in CHS courses appear on an official University of Pittsburgh transcript, and the course credits are likely to be eligible for transfer to other colleges and universities. Students are encouraged to contact potential colleges and universities in advance to ensure their CHS credits would be accepted. If students decide to attend any University of Pittsburgh campuses, the University of Pittsburgh grade earned in the course will count toward the student grade point average at the University. At the University of Pittsburgh, the CHS course supersedes any equivalent AP credit.

**Drops and Withdrawals:** Students should monitor progress in a course. CHS teacher can obtain a Course Drop/Withdrawal Request form from the CHS office or Aspire. The form must be completed by the student, teacher and parent/guardian and returned to teacher by deadlines listed. Dropping and withdrawing from the CHS course has no effect on enrollment in the high school credits for the course.