

# Course Syllabus

**Course Name:** Chemistry 1

**Description:** In this course, students will study of the foundations of chemistry, building on the concepts and scientific thinking developed in middle school science. Students use scientific inquiry and higher-order problem solving as they explore the composition, properties, and changes of matter and their applications through interactive simulations, engineering solutions, and virtual and hands-on experiences. The scientific process is fully used and documented in lab investigations, giving students the skills they need to analyze data and make inferences about natural phenomena. In addition, technology, engineering, and mathematics (STEM) concepts are integrated throughout the course. Through phenomenon-based learning, students will be able to demonstrate a vast understanding of the importance of chemistry in the world, enabling them to apply these principles to their everyday lives and our global society.

**Prerequisites:** Algebra 1 strongly recommended

**Estimated Completion Time:** 2 segments / 32–36 weeks.

## Major Topics and Concepts:

### Segment One:

- Learn about the mathematical skills and measurement systems used in chemistry
- Interpret scientific data and explain relationships between variables based on data
- Follow the scientific method to conduct various laboratory investigations
- Explore the differences between all states of matter and the classification of matter
- Differentiate between physical and chemical properties and changes in matter
- Explore the development of the scientific model of atoms from investigations of the past
- Use the model of the atom to understand subatomic particles and reading the periodic table
- Read the periodic table and determine the general properties of elements, groups, and families
- Utilize the periodic table as a fundamental tool for a variety of chemistry problems and applications
- Write electron configurations and draw orbital notation models for atoms
- Determine valence electrons and bonding properties of atoms
- Read, write, interpret, and model chemical formulas for ionic and covalent bond
- Compare the different intermolecular forces in compounds and model molecule structures
- Apply the law of conservation of mass to balance chemical equations
- Classify synthesis, decomposition, combustion, single and double replacement, and redox chemical reactions
- Compare the fundamental forces and chemical and nuclear reactions

### Segment Two:

- Understand the use of the mole as a significant unit of measurement in chemistry applications
- Determine mass, molar mass, and number of particles for elements and compounds
- Use balanced chemical equations to determine mole ratios for stoichiometric calculations
- Perform a variety of stoichiometric calculations, including percent yield and limiting reactants

- Differentiate between the different forms of energy and the interaction between thermal energy and matter
- Describe the properties and behavior of matter in relation to kinetic theory
- Read, interpret, and construct heating and cooling curves
- Learn about and apply various gas law relationships and the ideal gas law
- Distinguish between endothermic and exothermic reactions and processes
- Explore the concepts of enthalpy and potential energy diagrams for chemical reactions
- Differentiate between open, closed, and isolated systems
- Explore the various factors that affect the rate of chemical reactions and the concept of dynamic equilibrium
- Apply Le Châtelier's principle to predict the outcomes of stress on a reaction in equilibrium
- Understand how the various properties of water make it suitable for processes on Earth
- Perform molarity and dilution calculations
- Compare and contrast acids and bases and calculate the pH or pOH of a solution

**Course Assessment and Participation Requirements:**

To achieve success, students are expected to submit work in each course weekly. Students can learn at their own pace; however, "any pace" still means that students must make progress in the course every week. To measure learning, students complete self-checks, practice lessons, multiple-choice questions, discussion-based assessments, discussions, and projects. Students are expected to maintain regular contact with teachers; the minimum requirement is monthly. When teachers, students, and parents work together, students are successful.

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