

SCI106: Integrated Chemistry- Physics

Scope & Sequence : Scope & Sequence documents describe *what* is covered in a course (the scope) and also the *order* in which topics are covered (the sequence). These documents list instructional objectives and skills to be mastered. K12 Scope & Sequence documents for each course include:

Course Overview

Students explore the relationship between matter and energy by investigating force and motion, the structure of atoms, the structure and properties of matter, chemical reactions, and the interactions of energy and matter. They review strategies for describing and measuring scientific concepts. Diagnostic tests assess students' current knowledge and generate individualized study plans, so students can focus on topics that need review.

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Course Length

Two Semesters

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Prerequisites

Student completed the course or its equivalent, but did not receive credit; teacher/school counselor recommendation required.

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Course Outline

SEMESTER ONE

Unit 1: Matter and Energy

In this unit, students learn about the depth of physical science, the relationship between matter and energy, and scientific methods. Students use scientific methods in a laboratory setting and demonstrate their results through graphing.

- Semester Introduction
- Dimensions: Distance, Time, and Mass
- Matter, Energy, and the Scientific Method
- Creating and Analyzing Graphs
- Optional Laboratory: Drop and Bounce

Unit 2: Forces and Motion

In this unit, students study Newton's three laws of motion, and they demonstrate those laws in a hands-on laboratory and in online simulations. Students also learn to define *acceleration* and *force*.

- Describing and Measuring Motion
- Acceleration
- Forces
- Optional Laboratory: Drop and Bounce Revisited
- Newton's First Law of Motion
- Newton's Second Law of Motion
- Newton's Third Law of Motion
- Optional Laboratory: Mass in Motion

Unit 3: Application of Forces

Students explore friction, gravity, and force in this unit. They begin to understand the concept of vectors and learn to describe force in terms of vectors.

- Friction
- Gravity
- Gravity and Motion
- Forces and Vectors
- Optional Laboratory: Net Force

Unit 4: Fluid Forces

An understanding of fluid forces is important to the study of physical science. In this unit, students observe and graph how shape influences movement through a fluid. They learn to define density and understand its relationship to buoyancy. Students relate the concept of pressure to buoyancy. Students learn to describe Pascal's and Bernoulli's principles.

- Pressure
- Buoyancy
- Optional Laboratory: Density and Buoyancy

- Pascal's Principle
- Bernoulli's Principle
- Optional Laboratory: Shapes and Fluid Forces

Unit 5: Energy

Energy has a profound effect on our physical environment. In this unit, students first develop a firm basis for understanding changes in energy and identifying potential and kinetic energy. Designing a thermos in a laboratory provides the basis for the development of students' understanding of how heat moves. As in other units, students' understanding of facts stems from their mastery of the big ideas of physical science.

- Energy
- Energy Change
- Potential and Kinetic Energy
- Optional Laboratory: Pendulum
- Optional Laboratory: Elasticity
- Heat Energy
- How Energy Moves
- Optional Laboratory: Heat Transfer
- Optional Laboratory: Design a Thermos

Unit 6: Work

Work and the ability to do work are the focus of this unit. Students explore the properties of a simple machine. They learn the factors that influence force. In their exploration, they also determine the effect of pulleys and levers—two simple machines.

- Work
- Simple Machines and Mechanical Advantage
- Power
- Optional Laboratory: Levers
- Optional Laboratory: Pulleys

Unit 7: Waves

The properties of waves and the effects of waves on physical systems are the focus of this unit. Students explore the different kinds of waves, and they learn the factors that influence waves. Students learn to define *frequency*, *wavelength*, and *pitch*. Finally, students learn to demonstrate and explain the Doppler effect.

- Introduction to Waves
- Properties of Waves
- Wave Energy
- Transverse and Longitudinal Waves
- Optional Laboratory: Waves
- Sound
- Frequency, Wavelength, and Pitch
- Optional Laboratory: Doppler Effect

Unit 8: Light

In this unit, students thoroughly explore the concept of light. They study the speed of light and how it is determined, the properties of the electromagnetic spectrum, and color. They learn to define *reflection* and *refraction*, and describe their characteristics.

- Light
- Speed of Light
- Reflection and Refraction
- Electromagnetic Spectrum
- Color

Unit 9: Electricity

Electricity and magnetism are the focus of this unit. Students explore electricity and magnetism as they build an electric motor. They learn the components that make up circuits.

- Electricity and Magnetism
- Optional Laboratory: Electric Motor
- Circuits

Unit 10: Semester Review and Test

- Semester Review
- Semester Test

SEMESTER TWO

Unit 1: Nature of Matter

The difference between matter and energy is the focus of this unit. Students examine the classification of matter, the nature of energy, and viscosity. In their laboratory, they demonstrate knowledge of these concepts through observation and data reporting.

- Semester Introduction
- Nature of Matter
- Classification of Matter
- Matter and Energy
- Optional Laboratory: Viscosity

Unit 2: States of Matter

Phase changes are a tangible way to understand the states of matter. In this unit, students observe phase changes. In their observation, they examine the properties of heat and energy. By the end of this unit, students have a solid knowledge of thermodynamics.

- States of Matter
- Matter Changes State
- Kinetic Theory of Matter
- Optional Laboratory: Evaporation
- Optional Laboratory: Phase Change
- Laws of Thermodynamics
- Heat Energy and Matter
- Optional Laboratory: Endothermic Process

Unit 3: Gas Laws

The environment is made up of gases. Students examine the laws that govern gases, paying particular attention to the effects of pressure, temperature, and volume. The gas laws are demonstrated in the laboratory.

- Gases
- Pressure, Temperature, and Volume
- Introduction to the Gas Laws
- Optional Laboratory: Gas Laws

Unit 4: Atoms

Students gain a firm basis for understanding the atom and its characteristics. Students look at the atom in greater detail, including the atomic model, atomic number, atomic mass, and atomic nucleus. Building on the big ideas of the atom, students develop a strong central basis for understanding radioactive dating, fusion, and fission.

- Atoms
- Atomic Model
- Atomic Number
- Atomic Mass
- Nucleus of the Atom
- Radioactivity
- Radioactive Dating
- Fusion and Fission

Unit 5: Elements

Students explore the properties of elements and the placement of elements in the periodic table. They begin to understand why an element is placed where it is in the table and draw conclusions about that element based on its location. They demonstrate an understanding of metals and nonmetals and the nature of compounds.

- Elements
- Periodic Table
- Properties of Metals and Nonmetals
- Elements and Compounds

Unit 6: Mixtures

Students learn to identify mixtures and solutions, and differentiate between certain kinds of solutions. They demonstrate a working knowledge of solubility in their laboratory.

- Introduction to Mixtures
- Introductions to Solutions
- Optional Laboratory: Mixtures
- Optional Laboratory: Solubility
- Factors That Influence Solubility

Unit 7: Bonds

The focus of this unit is bonding: the configuration of electrons and different kinds of bonds. Understanding bonding is essential to a study of physical science. In addition to giving students a firm understanding of bonding, this unit prepares students for understanding what happens in chemical reactions.

- Electron Configurations
- Valence Electrons
- Ionic Bonds
- Covalent Bonds
- Polar Covalent Bonds and Electronegativity
- Hydrogen Bonding and Metallic Bonding

Unit 8: Chemical Reactions

The focus of this unit is an understanding of chemical reactions. Students observe chemical reactions and draw conclusions about what happened in those reactions. They apply their knowledge of bonding as they balance chemical equations. Students also explore solutions chemistry.

- Introduction to Chemical Reactions
- Optional Laboratory: Chemical Reactions
- Optional Laboratory: Copper-Plating Solution
- Chemical Reactions Explained
- How to Balance a Chemical Equation
- Solution Chemistry

Unit 9: Acids and Bases

In this unit, students focus on acid and base reactions. They start out learning the definition of acid and base. They learn to explain and use the pH scale and describe the properties of acids and bases. Students observe acid–base reactions and learn the importance of buffers.

- Acids
- Bases
- pH Scale
- Acid and Base Reaction
- Buffers
- Optional Laboratory: Acid Neutralization

Unit 10: Organic Chemistry

Students explore the field of organic chemistry through a thorough exploration of the four macromolecules: proteins, carbohydrates, lipids, and nucleic acids. They study the functional groups that make up those compounds.

- Organic Chemistry
- Functional Groups
- Macromolecules

Unit 11: Semester Review and Test

- Semester Review
- Semester Test

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Materials

Please note: Course materials will be available in various formats, which may include physical and/or digital materials.

None

NOTE: List subject to change