

Advanced Physical Science



Course Outline

Introduction and Chemistry

In this unit students launch their excursion into the world of physical science. They begin by understanding some of the rudiments of the metric system and doing a laboratory exercise. Students then begin to examine some aspects of matter, including a look at its various states, physical and chemical changes, and mixtures. A laboratory in separating solutions gives them a chance to make and use a distillation apparatus.

- Introduction to Physical Science
- Laboratory: Measured Steps
- Physical Systems
- Fundamental Quantities and Measurement
- Working with Model Problems
- Laboratory: Separating Ingredients
- Properties of Matter
- Classification of Matter
- Solids, Liquids, and Gases
- Physical and Chemical Changes
- Mixtures and Solutions
- Structure of the Atom

Chemistry 2

The world of chemistry opens up for student in this lesson. Students perform two laboratories to get hands-on experience with chemical procedures. They also learn chemical subjects such as atomic numbers, types of chemical reactions, balancing chemical reactions, types of bonding, and acids and bases. This gives students a solid understanding of the basic areas of chemistry.

- Laboratory: Chemical Reactions
- Atomic and Mass Numbers
- Periodic Table
- Ionic and Covalent Compounds
- Chemical Formulas
- Chemical Reactions
- Laboratory: Titrating Vinegar
- Balancing Chemical Equations
- Rates of Chemical Reactions
- Acids and Bases

Motion and Forces

This unit deals with physics, focusing on aspects of motion and forces. Students have hands-on experience doing a laboratory on the topic of speed. Motion and forces are explored in such subjects as the pendulum, motion in two directions, and gravity. This unit includes a semester review and test.

- Laboratory: Calculating Speed
- Displacement, Speed, and Velocity
- Acceleration
- Newton's First Law
- Newton's Second Law
- Equal and Opposite Forces
- The Pendulum 1
- Motion of a Projectile
- Motion in a Circle
- Harmonic Motion
- The Pendulum 2
- Gravitation I
- Gravitation II

Energy and Thermodynamics

Students delve more deeply into physics in this unit. They begin by studying problems in work and energy, using simple machines as a starting point. They then move into a related study—thermodynamics, the study of heat. Along the way students do laboratories on using a lever and the flow of heat. Energy is the key word in this lesson and students gain a lot of experience in using this term correctly.

- Laboratory: Using a Lever
- Energy: Conservation and Transformation
- Work
- Simple Machines
- Work and Kinetic Energy
- Potential Energy
- Linear Momentum
- Collisions
- Laboratory: Heat Flow
- Thermal Energy
- Temperature
- First Law of Thermodynamics
- Second Law of Thermodynamics

Waves, Light, Electricity, and Magnetism

Energy continues to be the central core of student learning in this lesson. Students learn about the characteristics of waves and apply that knowledge to a study of light and sound. They then turn their attention to electricity and magnetism, building a motor in a laboratory to gain experience in working with electrical currents.

- Laboratory: Path of Light
- Characteristics of Waves
- Sound Waves
- Understanding Light
- Reflection and Refraction



- Laboratory: Motoring On!
- Electric Charge
- Electric Fields and Potentials
- Circuits
- Magnetism
- Currents and Magnetic Fields

Research Project

In this middle school program, students conduct a scientific investigation following scientific methods for each discipline. Students choose a research topic, develop a hypothesis, experiment, take and organize data, and develop a science presentation. This is a hands-on unit that gives students the feel of conducting scientific research.

- Science Research Topic
- Design and Set Up Your Experiment
- Data Collection
- Data Analysis
- Writing a Research Paper
- Construct a Display Poster
- Oral Presentation