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# Integrated Physics and Chemistry 1B

## Course Description

Physical Science 1B is designed to help students master physical science concepts as they investigate topics such as motion, Newton's laws, vectors, friction, gravity, energy, machines, sound and light waves, electricity, and magnetism.

Skills in scientific inquiry, reading, and writing are incorporated throughout the course as students participate in discussions, and complete labs and writing assignments. Within each unit, students visit websites to explore science topics such as the six fundamental overtones, energy sources and conservation, nuclear fission and fusion, and superconductors. Students are engaged by Fun With Science and Did You Know? segments that illustrate the real-world application of learned concepts.

## Overview

### Unit 1 – Motion

- Lesson 1: Motion Basics
- Lesson 2: Newton's Laws
- Lesson 3: Two-Dimensional Motion
- Lesson 4: Momentum

### Unit 2 – Energy

- Lesson 1: Energy, Work, and Simple Machines
- Lesson 2: Thermal Energy
- Lesson 3: Energy Sources

### Unit 3 – Waves

- Lesson 1: Vibrations and Waves
- Lesson 2: Sound
- Lesson 3: Light and Color

### Unit 4 – Electricity and Magnetism

- Lesson 1: Electricity
- Lesson 2: Magnetism

## Objectives

Students completing this course will be able to demonstrate the following skills:

- Identify Aristotle's, Galileo's, and Newton's contributions to our modern theory of motion.
- Perform calculations involving the equation for average speed, velocity, and acceleration.
- Explain Newton's laws of motion.
- Compare the differences between scalar and vector quantities.
- Discover that horizontal motion for projectiles will be at constant velocity, and vertical motion will be accelerated by gravity.
- Recognize that circular motion is accelerated motion because the object is constantly changing its direction of motion.
- Define momentum as the product of the mass and velocity of an object.
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- Demonstrate that the force of gravity is directly proportional to the masses of objects and indirectly proportional to the square of the distance between objects.
- Recognize that when people are in different frames of reference, they will observe different types of motion.
- Define work as force applied over a distance.
- Define power as the rate at which work is done, or the work done in a given amount of time.
- Calculate the efficiency of a machine, and identify the mechanical advantage of machines that multiply force, multiply distance, or change the direction of force.
- Understand that heat is energy that flows between objects at different temperatures.
- Explain why solids, liquids, and gases expand when heated and contract when cooled.
- Identify examples of the different forms of kinetic and potential energy.
- Understand that waves transfer energy from one place to another.
- Differentiate between reflection, refraction, diffraction, and interference of light.
- Recognize that sound is a form of energy that causes the particles of a medium to vibrate.
- Describe the Doppler effect and the causes of the Doppler effect.
- Recognize that light is an electromagnetic wave.
- Identify the speed of light, and recognize that the speed of light is the speed limit of the universe.
- Recognize that the force of attraction between two charged objects is directly proportional to the charge of the objects and is inversely proportional to the square of the distance between the objects.
- Compare and contrast series and parallel circuits
- Recognize that electric current flowing through a wire will produce a magnetic field around a wire.
- Use Ohm's Law to relate the voltage, current, and resistance of an electric circuit to one another other.

## Activities and Assessments

- **7 Laboratory Activities** – Within the course, students complete seven labs which involve activities such as observation, experimentation, making and testing hypotheses, and describing results and conclusions. The instructor grades these lab activities and provides feedback.
- **7 Online Discussion Group Activities** – Within each unit, students participate in one or two group discussions of a topic relevant to the material covered. The teacher evaluates the students' contributions to the discussion and provides grading and feedback.
- **2 Writing Assignments** – In addition to the written portions of laboratory activities, students demonstrate their understanding of the concepts in this course by completing two notebook assignments. The teacher grades these assignments and provides feedback.
- **12 Quizzes, 4 Unit Evaluations, and 1 Final Exam** – Along with numerous self-check activities throughout the course, there is a quiz at the end of each of the twelve lessons. There is also an evaluation at the end of each of the four units. At the conclusion of the course, students are given one opportunity to complete a comprehensive final exam. All of these assessments are computer-graded and provide students with instant feedback on their work.