

SC Physics II

Students will use scientific skills and processes to explain the interactions of matter and energy and the energy transformations that occur using advanced analysis methods emphasizing advanced mathematics. This course follows the Educational Testing Services Advanced Placement Physics “B” curriculum. More information can be found at <http://www.collegeboard.org>.

SC.PH2.10 Students will use the language and instruments of science to apply the skills of scientific inquiry to understand the nature of science.

- SC.PH2.10.01 Demonstrate safety when conducting an investigation (CS1.12.5)
SC.PH2.10.01a Recognize safe laboratory procedures (CLG 1.3.2*)
SC.PH2.10.01b Demonstrate safe handling of the chemicals and materials of science (CLG 1.3.3*)
- SC.PH2.10.02 Demonstrate proficiency in using the metric system
SC.PH2.10.02.a Appropriately apply the basic units of meter, liter, and gram **TA**
SC.PH2.10.02.b Appropriately apply the metric system to measure mass, volume, length, and temperature **TA**
- SC.PH2.10.03 Apply the steps of the scientific method when given problem solving situations
SC.PH2.10.03.a Access and process information from readings, investigations, and/or oral communications (CS1.12.1*, CLG1.5.6*, CLG 1.3.4*, CLG1.2.7*) **TA**
SC.PH2.10.03.b Formulate questions that lead to a testable hypothesis (CS1.12.2*, CS1.12.3*, CLG1.2.3*, CLG1.2.1*, CLG1.2.2*, CLG1.2.4*)
SC.PH2.10.03.c Design logically sequenced, experimental approaches which appropriately control dependent and independent variables and answer scientific questions (CS1.12.4*, CS1.12.7*, CLG1.2.5*, CLG1.2.6*) **TA**
SC.PH2.10.03.d Conduct scientific investigations to test a hypothesis (CS1.12.7, CLG1.3.1*) **TA**
- SC.PH2.10.04 Demonstrate proficiency in the use of the appropriate language and instruments of science to appropriately collect, organize, and display data (CS1.12.7*, CLG1.4.1*)
SC.PH2.10.04.a Collect data for mass, volume, length and temperature **TA**
SC.PH2.10.04.b Create and/or interpret graphics (scale drawings, photographs, digital images, etc) analyze data and evaluate hypotheses (CS1.5.4*) **TA**
SC.PH2.10.04.c Design, construct, and use models to make predictions about and to visualize actual events (CS1.12.22, CLG1.4.8*) **TA**
SC.PH2.10.04.d Use mathematical process when conducting investigations, analyzing information, and /or displaying information (CS1.12.6*, CLG1.6.1*, CLG1.6.2*, CLG1.6.3*, CLG1.6.4*, CLG1.6.5*, CLG1.7.4*) **TA**

SC.PH2.20 Students will apply critical thinking skills to understand the nature of science.

- SC.PH2.20.01 Demonstrate proficiency in evaluating scientific data in terms of bias, reliability and validity (CS1.12.8*, CLG1.4.3*, CLG1.4.5*)
SC.PH2.20.01.a Analyze appropriate data to classify, identify trends, and identify similarities and differences to form conclusions and apply what has been learned to evaluate the hypothesis (CS1.12.8*, CS1.12.10*, CS1.12.11*, CLG1.4.2*, CLG1.4.4*, CLG1.4.6*, CLG1.4.9*, CLG1.5.7*, CLG1.5.8*)
- SC.PH2.20.02 Demonstrate proficiency in formulating conclusions (CS1.12.9*, CLG1.5.1*, CLG1.5.2*, CLG1.5.9*)
SC.PH2.20.02.a Analyze the adequacy of supporting evidence used to form conclusions (CS1.12.13*, CLG1.4.7*)
SC.PH2.20.02.b Provide supporting evidence when forming conclusions (CS1.12.14*, CLG1.2.8*)
- SC.PH2.20.03 Modify ideas based on new information (CS1.12.16*, CLG1.1.2*)
SC.PH2.20.03.a Defend a position on a scientific issue (SC1.12.20*)
SC.PH2.20.03.b Recognize that real problems have more than one solution (CS1.12.21*, CLG1.1.1*)
- SC.PH2.20.04 Apply scientific principles and/or concepts to understand a new situation (CS1.12.18*, CS1.12.19*, CLG1.7.1*, CLG1.7.3)
- SC.PH2.20.05 Critique scientific information in order to detect bias and analyze the source of the bias (CS1.12.12*, CLG1.1.3*, CLG1.1.4*, CLG1.1.5*)

CLG = Core Learning Goal
TA = Technology Appropriate
ETM = Education That is Multicultural

- SC.PH2.30 Students will connect the various aspects of technology to the nature of science.**
 SC.PH2.30.01 Use computational tools and technologies in data collection, analysis and modeling **TA**
 SC.PH2.30.02 Demonstrate and explain how using existing tools extend knowledge and identify the limitations, which drive the need for new technologies (CS1.12.23*, CLG1.7.6*) **TA**
 SC.PH2.30.03 Interpret and communicate findings using developmentally appropriate technology and telecommunications (CS1.12.9*, CLG1.5.5*) **TA**
- SC.PH2.40 Students will use appropriate methods to communicate, in writing and orally, the processes and results of scientific investigation (the nature of science).**
 SC.PH2.40.01 Interpret and communicate findings through speaking, writing, and drawing (CS1.12.9*, CS1.12.17*, CLG1.5.3*) **TA**
- SC.PH2.50 Students will apply laws of mechanics to advanced topics on the behavior of the physical world.**
 SC.PH2.50.01 The student will apply the kinematics equations to vector analysis, one-dimensional motion and two-dimensional motion. (CS 5.12.1, CLG 5.1.2*) **TA**
 SC.PH2.50.02 The student will apply Newton's Laws of Motion (including friction and centripetal force) to static equilibrium, dynamics, and multi-body systems. (CS 5.12.1, CLG 5.1.3*) **TA**
 SC.PH2.50.03 The student will apply the concept of energy to the work-energy theorem, conservative force fields, potential energy, conservation of energy and power. (CS 5.12.1, CLG 5.1.4*) **TA**
 SC.PH2.50.04 The student will apply the concepts of impulse and momentum, conservation of linear momentum, collisions, and explosions. (CS 5.12.1, CLG 5.1.5*) **TA**
 SC.PH2.50.05 The student will apply circular and rotation concepts to uniform circular motion, angular momentum, conservation of angular momentum, moment of inertia, torque, and rotational statics. (CS 5.12.1, CLG 5.1.2*) **TA**
 SC.PH2.50.06 The student will apply oscillation and gravitational concepts to simple harmonic motion, the mass-spring system, pendulum, Newton's Universal Law of Gravitation, and orbital dynamics. (CS 5.12.1, CLG 5.1.3*) **TA**
- SC.PH2.55 Students will apply laws of thermodynamics to advanced topics on the behavior of the physical world.**
 SC.PH2.55.01 The student will apply the properties of temperature and heat to the mechanical equivalent of heat, specific heat, latent heat, heat transfer and thermal expansion. (CS 5.12.1, CLG 5.3.1*) **T**
 SC.PH2.55.02 The student will apply the laws of kinetic theory and thermodynamics to the kinetic ideal gas model, kinetic ideal gas law, First Law of Thermodynamics and Second Law of Thermodynamics. (CS 5.12.1, CLG 5.3.1*) **T**
- SC.PH2.60 Students will apply laws of electromagnetism to advanced topics on the behavior of the physical world.**
 SC.PH2.60.01 The student will apply the concepts of electrostatics fields, forces and potentials to point charges, planar charge distributions, and Coulomb's Law. (CS 5.12.1, CLG 5.2.1*) **TA**
 SC.PH2.60.02 The student will apply concepts of conductors and capacitors to parallel plates. (CS 5.12.1, CLG 5.2.2*) **TA**
 SC.PH2.60.03 The student will apply Kirchoff's Laws to Ohm's Law, steady state direct current circuits, and steady state capacitor circuits. (CS 5.12.1, CLG 5.2.1*) **TA**
 SC.PH2.60.04 The student will apply the concepts of magnetostatics to sources on moving charges in a magnetic field, forces on current-carrying wires in a magnetic field, and fields due to current carrying wires. (CS 5.12.1, CLG 5.2.2*) **TA**
 SC.PH2.60.05 The student will apply the concepts of electromagnetic analysis to electromagnetic induction, Faraday's Law, and Lenz's Law. (CS 5.12.1, CLG 5.2.4*) **TA**
- SC.PH2.65 Students will apply laws of waves and optics to advanced topics on the behavior of the physical world.**
 SC.PH2.65.01 The student will apply the concepts of wave motion to traveling waves, standing waves, Doppler effect and superposition. (CS 5.12.1, CLG 5.4.1*) **TA**
 SC.PH2.65.02 The student will apply concepts of wave interactions to interference, diffraction, and dispersion. (CS 5.12.1, CLG 5.4.2*) **TA**
 SC.PH2.65.03 The student will apply the laws of optics to reflection, refraction, mirrors and lenses. (CS 5.12.1, CLG 5.4.4*)

- SC.PH2.70** **Students will apply atomic and nuclear laws to advanced topics on the behavior of the physical world.**
- SC.PH2.70.01 The student will apply the concepts of atomic and quantum properties to alpha particle scattering, the Rutherford model, photons, the photoelectric effect, the Bohr model, energy levels, and wave-particle duality. (CS 5.12.1, CLG 5.5.1*)
- SC.PH2.70.02 The student will apply concepts of nuclear physics to radioactivity, half-life, and nuclear reactions. (CS 5.12.1, CLG 5.5.2*) **TA**
- SCI. PH2.80** **Students will investigate the impact of physics on society.**
- SC.PH2.80.01 Investigate a social issue related to physics such as alternate energy sources, fiber optics in telecommunications, nuclear power, microwave technology, effect of power lines, etc. (CS 1.12.20, CLG 5.6.1) **TA**
- SC.PH2.80.02 Recognize data that is biased. (CS 1.12.12, CLG 5.6.2*)
- SC.PH2.80.03 Recognize that real problems have more than one solution and decisions to accept one solution over another are made on the basis of many issues. (CS 1.12.21, CLG 5.6.3*)
- SC.PH2.80.04 Use graphs, tables, and charts to display data in making arguments and claims in both written and oral communications. (CS 1.12.9, CLG 5.6.4*) **TA**
- SCI. PH2.85** **Students will show that connections exist both within the various fields of science and among science and other disciplines.**
- SC.PH2.85.01 Apply physics to the concepts of biology, chemistry, earth science, and environmental science. (CS 1.12.19, CLG 5.7.1*) **TA**
- SC.PH2.85.02 Recognize the important role that mathematics serves when solving problems in physics. (CS 1.12.6, CLG 5.7.2*) **TA**
- SC.PH2.85.03 Investigate the role of physics in areas of human endeavor and achievement. (CS 1.12.19, CLG 5.7.3*)
- SC. PH2.90** **Students will construct meaning about the people and events that have shaped the nature of science.**
- SC.PH2.90.01 Students will investigate career possibilities in the various areas of science (CS1.12.28, CLG1.7.5*)
- SC.PH2.90.02 Students will explain that science and technology have strongly influenced the course of history (CS1.12.26*, CLG1.7.2*) **TA**
- SC.PH2.90.03 Students will describe how various cultures from ancient times to the present have made contributions that led to current scientific ideas and technological inventions (CS1.12.27*) **TA, ETM**
- SC.PH2.90.04 Students will explain that scientific careers differ from one another in what is studied, techniques used, where studied, and outcomes sought but they share a common purpose and philosophy and are part of the same scientific enterprise. (CS1.12.28) **ETM**

CLG = Core Learning Goal
 TA = Technology Appropriate
 ETM = Education That is Multicultural