

SC Physics I

Students will use scientific skills and processes to explain the interactions of matter and energy and the energy transformations that occur.

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

- SC.PHI.10.01 Demonstrate safety when conducting an investigation (CS1.12.5)
SC.PHI.10.01a Recognize safe laboratory procedures (CLG 1.3.2*)
SC.PHI.10.01b Demonstrate safe handling of the chemicals and materials of science (CLG 1.3.3*)
- SC.PHI.10.02 Demonstrate proficiency in using the metric system
SC.PHI.10.02.a Appropriately apply the basic units of meter, liter, and gram **TA**
SC.PHI.10.02.b Appropriately apply the metric system to measure mass, volume, length, and temperature **TA**
- SC.PHI.10.03 Apply the steps of the scientific method when given problem solving situations
SC.PHI.10.03.a Access and process information from readings, investigations, and/or oral communications (CS1.12.1*, CLG1.5.6*, CLG1.3.4*, CLG1.2.7*) **TA**
SC.PHI.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.PHI.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.PHI.10.03.d Conduct scientific investigations to test a hypothesis (CS1.12.7, CLG1.3.1*)
- SC.PHI.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*) **TA**
SC.PHI.10.04.a Collect data for mass, volume, length and temperature **TA**
SC.PHI.10.04.b Create and/or interpret graphics (scale drawings, photographs, digital images, etc) analyze data and evaluate hypotheses (CS1.5.4*) **TA**
SC.PHI.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.PHI.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.PHI.20 Students will apply critical thinking skills to understand the nature of science.

- SC.PHI.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.PHI.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.PHI.20.02 Demonstrate proficiency in formulating conclusions (CS1.12.9*, CLG1.5.1*, CLG1.5.2*, CLG1.5.9*)
SC.PHI.20.02.a Analyze the adequacy of supporting evidence used to form conclusions (CS1.12.13*, CLG1.4.7*)
SC.PHI.20.02.b Provide supporting evidence when forming conclusions (CS1.12.14*, CLG1.2.8*)
- SC.PHI.20.03 Modify ideas based on new information (CS1.12.16*, CLG1.1.2*)
SC.PHI.20.03.a Defend a position on a scientific issue (SC1.12.20*)
SC.PHI.20.03.b Recognize that real problems have more than one solution (CS1.12.21*, CLG1.1.1*)
- SC.PHI.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.PHI.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*)

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- SC.PHI.30 Students will connect the various aspects of technology to the nature of science.**
- SC.PHI.30.01 Use computational tools and technologies in data collection, analysis and modeling **TA**
- SC.PHI.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.PHI.30.03 Interpret and communicate findings using developmentally appropriate technology and telecommunications (CS1.12.9*, CLG1.5.5*) **TA**
- SC.PHI.40 Students will use appropriate methods to communicate, in writing and orally, the processes and results of scientific investigation (the nature of science).**
- SC.PHI.40.01 Interpret and communicate findings through speaking, writing, and drawing (CS1.12.9*, CS1.12.17*, CLG1.5.3*) **TA**
- SC.PHI.50 Students will know and apply laws of mechanics to the behavior of the physical world.**
- SC.PHI.50.01 The student will know and apply the equations of straight-line motion. (CS 5.12.1, CLG 5.1.2*) **TA**
- SC.PHI.50.02 Construct and interpret the following graphs: displacement vs. time, velocity vs. time, gravitational force vs. distance between centers of gravity, force vs. time, and force vs. distance. (CS 5.12.1, CLG 5.1.1*) **TA**
- SC.PHI.50.03 Identify vector quantities and perform vector operations. (to include force and velocity vectors) (CS 5.12.1, CLG 5.1.1*) **TA**
- SC.PHI.50.04 Discuss and analyze motion in two dimensions: projectile and circular, to include perpendicular components of vectors. (CS 5.12.1, CLG 5.1.2*) **TA**
- SC.PHI.50.05 Analyze and explain how changes in an object's motion are described by Newton's Laws. (CS 5.12.1, CLG 5.1.3*) **TA**
- SC.PHI.50.05.a Analyze and explain how unbalanced forces affect an object's acceleration. (CLG5.1.5) **TA**
- SC.PHI.50.05.b Investigate the relationship between mass, net force and acceleration; to include normal force, applied force, tension, friction, Hooke's Law and the difference between mass and weight. (CLG5.1.3) **TA**
- SC.PHI.50.05.c Given an action force, identify the reaction force using Newton's Third Law of Motion. (CLG5.1.3) **TA**
- SC.PHI.50.06 Identify factors which influence the force of friction and calculate the force of friction using appropriate equations. (CS 5.12.1, CLG 5.1.3*, CLG 5.1.4*) **TA**
- SC.PHI.50.07 Analyze the behavior of forces in terms of comparison of magnitude and the inverse square nature of gravitational and electromagnetic forces. (CS 5.12.1, CLG 5.1.4*) **TA**
- SC.PHI.50.08 Relate translational equilibrium to structures and the motion of objects. (CS 5.12.1, CLG 5.1.3*) **TA**
- SC.PHI.50.09 Relate the impulse-momentum theorem to Newton's Laws. (CGL5.1.3) **TA**
- SC.PHI.50.10 Apply the Law of Conservation of Momentum to elastic and inelastic collisions. (CS 5.12.1, CLG 5.1.5*) **TA**
- SC.PHI.50.11 Describe and apply the relationships between net force, work, energy, work-energy theorem and power. (CS 5.12.1, CLG 5.1.4) **TA**
- SC.PHI.50.12 Describe and apply the Law of Conservation of Energy to physical systems. (CGL5.1.4)
- SC.PHI.60 Students will apply the laws of waves and optics to topics on the behavior of the physical world.**
- SC.PHI.60.01 Describe and demonstrate how waves can be used to transmit mechanical and electromagnetic energy. (CS 5.12.14, CLG 5.4.1*) **TA**
- SC.PHI.60.02 Distinguish between transverse and longitudinal waves. (CS 5.12.14, CLG 5.4.2*) **TA**
- SC.PHI.60.03 Describe and calculate wave characteristics using wave velocity equation (to include frequency, wavelength, velocity, amplitude, intensity). (CS 5.12.14, CLG 5.4.3*) **TA**
- SC.PHI.60.04 Predict the effects of different media on the behavior of waves i.e. refraction, reflection, and diffraction. (CS 5.12.14, CLG 5.4.4*) **TA**
- SC.PHI.60.05 Analyze wave interactions: superposition and interference. (CS 5.12.14, CLG 5.4.4*) **TA**
- SC.PHI.60.06 Describe and apply the Doppler Effect. (CS 5.12.14, CLG 5.4.4*) **TA**
- SC.PHI.60.07 Identify the properties of sound waves. (CS 5.12.14, CLG 5.4.4*) **TA**
- SC.PHI.60.08 Identify the properties of light (CS 5.12.14, CLG 5.4.4*) **TA**
- SC.PHI.60.09 State the laws of reflection and refraction, and apply these laws to mirrors and lenses. (CS 5.12.14, CLG 5.4.4*)
- SC.PHI.60.10 Identify the images formed by mirrors and lenses using lens and mirror equations and ray diagrams. (CS 5.12.14, CLG 5.4.4*)

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- SC.PHI.65 Students will apply the laws of electromagnetism to topics on the behavior of the physical world.**
- SC.PHI.65.01 Describe the types of electric charges and the forces that exist between them in terms of magnitude, sign, and the application of Coulomb’s Law. (CS 5.12.10, CLG 5.2.1*) **TA**
- SC.PHI.65.02 Describe the sources and effects of electric and magnetic fields. (CS 5.12.10, CLG 5.2.2*) **TA**
- SC.PHI.65.03 Diagram electric and magnetic fields and their interactions. (CS 5.12.10, CLG 5.2.3*) **TA**
- SC.PHI.65.04 Apply Ohm’s laws to series and parallel circuits and distinguish between them. (CS 5.12.10, CLG 5.2.1*) **TA**
- SC.PHI.65.05 Relate voltage, current and power to direct current circuits. (CS 5.12.10, CLG 5.2.2*) **TA**
- SC.PHI.65.06 Explain the principle of electromagnetic induction and its applications to motors, generators, and transformers. (CS 5.12.10, CS 5.2.4) **TA**
- SC.PHI.65.07 Describe how different kinds of materials respond to electric and magnetic fields: conductors, insulators, semiconductors, and magnetic materials. (CS 5.12.10, CLG 5.2.3*) **TA**
- SC.PHI.70 Students will apply the laws of thermodynamics to topics on the behavior of the physical world.**
- SC.PHI.70.01 Relate the laws of thermodynamics to energy changes in a system (CS 5.12.7, CLG 5.3.1) **TA**
- SC.PHI.70.02 Identify the methods of heat transfer and apply them to current technology (CS 5.12.7, CLG 5.3.1) **TA**
- SC.PHI.75 Students will relate the limitations of classical physics to the development of modern physics theories.**
- SC.PHI.75.01 Cite evidence of the quantum nature of matter and energy and its applications. (CS 5.12.19, CLG 5.5.1*)
- SC.PHI.75.02 Define and identify applications of the photoelectric effect. (CS 5.12.19, CLG 5.5.1*) **TA**
- SC.PHI.75.03 Describe the dual nature of light. (CS 5.12.19, CLG 5.5.1*)
- SC.PHI.75.04 Apply the quantum nature of matter and energy to current technology. (CS 5.12.19, CLG 5.5.2*) **TA**
- SC.PHI.75.05 Explain the processes of nuclear fission and nuclear fusion and their applications in current technology. (CS 5.12.19, CLG 5.5.2*)
- SC.PHI.75.06 Relate radioactive decay to nuclear stability. (CS 5.12.19, CLG 5.5.2*) **TA**
- SC.PHI.75.07 Relate the law of conservation of matter and energy to nuclear power. (CS 5.12.19, CLG 5.5.2*)
- SC.PHI.85 Students will investigate the impact of physics on society.**
- SC.PHI.85.01 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.PHI.85.02 Recognize data that is biased. (CS 1.12.12, CLG 5.6.2*)
- SC.PHI.85.03 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.PHI.85.04 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**
- SC.PHI.90 Students will show that connections exist both within the various fields of science and among science and other disciplines.**
- SC.PHI.90.01 Apply physics to the concepts of biology, chemistry, earth science, and environmental science. (CS 1.12.19, CLG 5.7.1*) **TA**
- SC.PHI.90.02 Recognize the important role that mathematics serves when solving problems in physics. (CS 1.12.6, CLG 5.7.2*) **TA**
- SC.PHI.90.03 Investigate the role of physics in areas of human endeavor and achievement. (CS 1.12.19, CLG 5.7.3*)
- SC.PHI.95 Students will construct meaning about the people and events that have shaped the nature of science.**
- SC.PHI.95.01 Students will investigate career possibilities in the various areas of science (CS1.12.28, CLG1.7.5*)
- SC.PHI.95.02 Students will explain that science and technology have strongly influenced the course of history (CS1.12.26*, CLG1.7.2*) **TA**
- SC.PHI.95.03 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.PHI.95.04 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**

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