

SC Physics with Applications

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

- SC.PWA.10 Students will use the language and instruments of science to apply the skills of scientific inquiry to understand the nature of science.**
- SC.PWA.10.01 Demonstrate safety when conducting an investigation (CS1.12.5)
SC.PWA.10.01a Recognize safe laboratory procedures (CLG 1.3.2*)
SC.PWA.10.01b Demonstrate safe handling of the chemicals and materials of science (CLG 1.3.3*)
- SC.PWA.10.02 Demonstrate proficiency in using the metric system
SC.PWA.10.02.a Appropriately apply the basic units of meter, liter, and gram **TA**
SC.PWA.10.02.b Appropriately apply the metric system to measure mass, volume, length, and temperature **TA**
- SC.PWA.10.03 Apply the steps of the scientific method when given problem solving situations
SC.PWA.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.PWA.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.PWA.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.PWA.10.03.d Conduct scientific investigations to test a hypothesis (CS1.12.7, CLG1.3.1*) **T**
- SC.PWA.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.PWA.10.04.a Collect data for mass, volume, length and temperature **TA**
SC.PWA.10.04.b Create and/or interpret graphs (scale drawings, photographs, digital images, etc) analyze data and evaluate hypotheses (CS1.5.4*) **TA**
SC.PWA.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.PWA.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.PWA.20 Students will apply critical thinking skills to understand the nature of science.**
- SC.PWA.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.PWA.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.PWA.20.02 Demonstrate proficiency in formulating conclusions (CS1.12.9*, CLG1.5.1*, CLG1.5.2*, CLG1.5.9*)
SC.PWA.20.02.a Analyze the adequacy of supporting evidence used to form conclusions (CS1.12.13*, CLG1.4.7*)
SC.PWA.20.02.b Provide supporting evidence when forming conclusions (CS1.12.14*, CLG1.2.8*)
- SC.PWA.20.03 Modify ideas based on new information (CS1.12.16*, CLG1.1.2*)
SC.PWA.20.03.a Defend a position on a scientific issue (SC1.12.20*)
SC.PWA.20.03.b Recognize that real problems have more than one solution (CS1.12.21*, CLG1.1.1*)
- SC.PWA.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.PWA.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*)
- SC.PWA.30 Students will connect the various aspects of technology to the nature of science.**
- SC.PWA.30.01 Use computational tools and technologies in data collection, analysis and modeling **TA**
- SC.PWA.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.PWA.30.03 Interpret and communicate findings using developmentally appropriate technology and telecommunications (CS1.12.9*, CLG1.5.5*) **TA**

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- SC.PWA.40 Students will use appropriate methods to communicate, in writing and orally, the processes and results of scientific investigation (the nature of science).**
 SC.PWA.40.01 Interpret and communicate findings through speaking, writing, and drawing (CS1.12.9*, CS1.12.17*, CLG1.5.3*) **TA**
- SC.PWA.50 Students will know and apply laws of mechanics to applications in the physical world.**
 SC.PWA.50.01 The student will know and apply the equations of straight-line motion. (CS 5.12.1, CLG 5.1.2*) **TA**
 SC.PWA.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.PWA.50.03 Identify vector quantities and perform vector operations. (CS 5.12.1, CLG 5.1.1*) **TA**
 SC.PWA.50.04 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.PWA.50.05 Recognize the four fundamental forces in nature. (CS 5.12.1, CLG 5.1.4*) **TA**
 SC.PWA.50.06 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.PWA.50.07 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.PWA.50.08 Relate translational and rotational equilibrium to the motion of objects. (CS 5.12.1, CLG 5.1.3) **TA**
 SC.PWA.50.09 Relate translational and rotational equilibrium to structures. (CS 5.12.1, CLG 5.1.3*) **TA**
 SC.PWA.50.10 Analyze motion in 2 dimensions: projectile and circular, to include perpendicular components of vectors. (CS 5.12.1, CLG 5.1.2*) **TA**
 SC.PWA.50.11 Apply the conservation of momentum to collisions. (CS 5.12.1, CLG 5.1.5*) **TA**
 SC.PWA.50.12 Describe and apply the relationships between work, energy, and power. (CS 5.12.1, CLG 5.1.4) **TA**
 SC.PWA.50.13 Analyze systems with regard to conservation of energy. (CS 5.12.1, CLG 5.1.5*) **TA**
- SC.PWA.60 Students will explain and demonstrate how vibrations and waves provide a model for our understanding applications of physical phenomena.**
 SC.PWA.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.PWA.60.02 Distinguish between transverse and longitudinal waves. (CS 5.12.14, CLG 5.4.2*)
 SC.PWA.60.03 Describe and calculate wave characteristics using wave equation. (CS 5.12.14, CLG 5.4.3*)
 SC.PWA.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.PWA.60.05 Analyze wave interactions: superposition and interference. (CS 5.12.14, CLG 5.4.4*) **TA**
 SC.PWA.60.06 Describe and apply the Doppler Effect. (CS 5.12.14, CLG 5.4.4*) **TA**
 SC.PWA.60.07 Identify the properties of sound waves. (CS 5.12.14, CLG 5.4.4*) **TA**
 SC.PWA.60.08 Identify the properties of light (CS 5.12.14, CLG 5.4.4*) **TA**
 SC.PWA.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.PWA.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*)
- SC.PWA.65 Students will know and apply the laws of electricity and magnetism and explain their significant role and applications in nature and technology.**
 SC.PWA.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.PWA.65.02 Describe the sources and effects of electric and magnetic fields. (CS 5.12.10, CLG 5.2.2*) **TA**
 SC.PWA.65.03 Diagram electric and magnetic fields and their interactions. (CS 5.12.10, CLG 5.2.3*) **TA**
 SC.PWA.65.04 Apply Ohm's laws to series and parallel direct current circuits. (CS 5.12.10, CLG 5.2.1*) **TA**
 SC.PWA.65.05 Relate and apply work, energy, and power to direct current circuits. (CS 5.12.10, CLG 5.2.2*) **TA**
 SC.PWA.65.06 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.PWA.65.07 Explain the principle of electromagnetic induction and its applications to motors, generators, and transformers. (CS 5.12.10, CS 5.2.4) **TA**

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- SC.PWA.70 Students will recognize and relate the laws of thermodynamics and practical applications.**
- SC.PWA.70.01 Relate the laws of thermodynamics to energy changes in a system (CS 5.12.7, CLG 5.3.1) **TA**
 SC.PWA.70.02 Identify the methods of heat transfer and apply them to current technology (CS 5.12.7, CLG 5.3.1) **TA**
- SC.PWA.75 Students will relate the limitations of classical physics to the development of modern physics theories and their applications.**
- SC.PWA.75.01 Cite evidence of the quantum nature of matter and energy and its applications. (CS 5.12.19, CLG 5.5.1*)
 SC.PWA.75.02 Define and identify applications of the photoelectric effect. (CS 5.12.19, CLG 5.5.1*) **TA**
 SC.PWA.75.03 Describe the dual nature of light. (CS 5.12.19, CLG 5.5.1*)
 SC.PWA.75.04 Apply the quantum nature of matter and energy to current technology. (CS 5.12.19, CLG 5.5.2*)
 SC.PWA.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.PWA.75.06 Relate radioactive decay to nuclear stability. (CS 5.12.19, CLG 5.5.2*) **TA**
 SC.PWA.75.07 Relate the law of conservation of matter and energy to nuclear power. (CS 5.12.19, CLG 5.5.2*)
- SC.PWA.80 Students will investigate the impact of physics on society.**
- SC.PWA.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.PWA.80.02 Recognize data that is biased. (CS 1.12.12, CLG 5.6.2*)
 SC.PWA.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.PWA.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**
- SC.PWA.85 Students will show that connections exist both within the various fields of science and among science and other disciplines.**
- SC.PWA.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.PWA.85.02 Recognize the important role that mathematics serves when solving problems in physics. (CS 1.12.6, CLG 5.7.2*) **TA**
 SC.PWA.85.03 Investigate the role of physics in areas of human endeavor and achievement. (CS 1.12.19, CLG 5.7.3*)
- SC.PWA.90 Students will construct meaning about the people and events that have shaped the nature of science.**
- SC.PWA.90.01 Students will investigate career possibilities in the various areas of science (CS1.12.28, CLG1.7.5*)
 SC.PWA.90.02 Students will explain that science and technology have strongly influenced the course of history (CS1.12.26*, CLG1.7.2*) **TA**
 SC.PWA.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.PWA.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**

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