



Physical Science (#2003310)

This document was generated on CPALMS - www.cpalms.org

Course Number: 2003310	Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences >
Number of Credits: One (1) credit	Abbreviated Title: PHY SCI
Course Type: Core Academic Course	Course Length: Year (Y)
Course Status: Course Approved	Course Level: 2
Graduation Requirement: Equally Rigorous Science	

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

<http://www.cpalms.org/uploads/docs/standards/eld/SC.pdf>

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Additional Instructional Resources:

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: [http://www.fasa.net/4DCGI/cms/review.html?](http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139)

[Action=CMS_Document&DocID=139](http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139). Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

Course Standards

Integrate Standards for Mathematical Practice (MP) as applicable.

- MAFS.K12.MP.1.1 Make sense of problems and persevere in solving them.
- MAFS.K12.MP.2.1 Reason abstractly and quantitatively.
- MAFS.K12.MP.3.1 Construct viable arguments and critique the reasoning of others.

- MAFS.K12.MP.4.1 Model with mathematics.
- MAFS.K12.MP.5.1 Use appropriate tools strategically.
- MAFS.K12.MP.6.1 Attend to precision.
- MAFS.K12.MP.7.1 Look for and make use of structure.
- MAFS.K12.MP.8.1 Look for and express regularity in repeated reasoning.

Name	Description
SC.912.E.7.1:	<p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> <p>Remarks/Examples: Describe that the Earth system contains fixed amounts of each stable chemical element and that each element moves among reservoirs in the solid earth, oceans, <u>atmosphere</u> and living <u>organisms</u>, as part of biogeochemical cycles (i.e., nitrogen, water, carbon, oxygen and phosphorus), which are driven by <u>energy</u> from within the Earth and from the Sun.</p>
SC.912.L.18.7:	Identify the reactants, products, and basic functions of photosynthesis.
SC.912.L.18.8:	Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.
SC.912.L.18.12:	<p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <p>Remarks/Examples: Annually assessed on Biology EOC.</p>
SC.912.N.1.1:	<p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p> <ol style="list-style-type: none"> 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others. <p>Remarks/Examples: Florida Standards Connections for 6-12 Literacy in Science <u>For Students in Grades 9-10</u></p> <p>LAFS.910.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</p> <p>LAFS.910.RST.1.3 Follow precisely a complex multistep procedure when carrying out <u>experiments</u>, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.</p> <p>LAFS.910.RST.3.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.</p> <p>LAFS.910.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ <u>experiments</u>, or technical processes.</p> <p>LAFS.910.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.</p> <p><u>For Students in Grades 11-12</u></p> <p>LAFS.1112.RST.1.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</p> <p>LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out <u>experiments</u>, taking measurements, or performing technical tasks analyze the specific results based on explanations in the text.</p> <p>LAFS.1112.RST.3.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</p> <p>LAFS.1112.WHST.1.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ <u>experiments</u>, or technical processes.</p> <p>LAFS.1112.WHST.3.9 Draw evidence from informational texts to support analysis, reflection, and research.</p> <p>Florida Standards Connections for Mathematical Practices</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them. MAFS.K12.MP.2: Reason abstractly and quantitatively. MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others. [Viable arguments include evidence.] MAFS.K12.MP.4: <u>Model</u> with mathematics. MAFS.K12.MP.5: Use appropriate tools strategically.</p>

	<p>MAFS.K12.MP.6: Attend to precision. MAFS.K12.MP.7: Look for and make use of structure. MAFS.K12.MP.8: Look for and express regularity in repeated reasoning.</p>
SC.912.N.1.2:	<p>Describe and explain what characterizes science and its methods.</p> <p>Remarks/Examples: Science is characterized by empirical <u>observations</u>, testable questions, formation of <u>hypotheses</u>, and experimentation that results in stable and replicable results, logical reasoning, and coherent theoretical constructs.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p>
SC.912.N.1.3:	<p>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</p> <p>Remarks/Examples: Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions.</p> <p>Florida Standards Connections: MAFS.K12.MP.2: Reason abstractly and quantitatively MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others</p>
SC.912.N.1.4:	<p>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</p> <p>Remarks/Examples: Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories. Strict standards of science include controlled <u>variables</u>, sufficient sample size, replication of results, empirical and measurable evidence, and the concept of falsification.</p> <p>Florida Standards Connections: LAFS.910.RST.1.1 / LAFS.1112.RST.1.1.</p>
SC.912.N.1.5:	<p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p>Remarks/Examples: Recognize that contributions to science can be made and have been made by people from all over the world.</p>
SC.912.N.1.6:	<p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p>Remarks/Examples: Collect data/evidence and use tables/graphs to draw conclusions and make <u>inferences</u> based on patterns or trends in the data.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them.</p>
SC.912.N.1.7:	<p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</p> <p>Remarks/Examples: Work through difficult problems using creativity, and critical and analytical thinking in problem solving (e.g. convergent versus divergent thinking and creativity in problem solving).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p>
SC.912.N.2.1:	<p>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</p> <p>Remarks/Examples: Science is the systematic and organized inquiry that is derived from <u>observations</u> and experimentation that can be verified or tested by further <u>investigation</u> to explain natural phenomena (e.g. Science is testable, pseudo-science is not science seeks falsifications, pseudo-science seeks confirmations.)</p>
SC.912.N.2.2:	<p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p> <p>Remarks/Examples: Identify scientific questions that can be disproved by experimentation/testing. Recognize that pseudoscience is a claim, belief, or practice which is presented as scientific, but does not adhere to strict standards of science (e.g. controlled <u>variables</u>, sample size, replicability, empirical and measurable evidence, and the concept of falsification).</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p>
SC.912.N.2.3:	<p>Identify examples of pseudoscience (such as astrology, phrenology) in society.</p> <p>Remarks/Examples: Determine if the phenomenon (event) can be observed, measured, and tested through scientific experimentation.</p>
SC.912.N.2.4:	<p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</p> <p>Remarks/Examples: Recognize that ideas with the most durable explanatory power become established theories, but scientific explanations are continually subjected to change in the face of new evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p>
SC.912.N.2.5:	<p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <p>Remarks/Examples: Recognize that scientific questions, <u>observations</u>, and conclusions may be influenced by the existing state of scientific knowledge, the social and cultural context of the researcher, and the observer's experiences and expectations. Identify possible bias in qualitative and quantitative data</p>

	analysis.
SC.912.N.3.1:	<p>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</p> <p>Remarks/Examples: Explain that a scientific theory is a well-tested <u>hypothesis</u> supported by a preponderance of empirical evidence.</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them and, MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p>
SC.912.N.3.2:	<p>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</p> <p>Remarks/Examples: Recognize that scientific argument, disagreement, discourse, and discussion create a broader and more accurate understanding of natural processes and events.</p> <p>Florida Standards Connections: MAFS.K12.MP.3: Construct viable arguments and critique the reasoning of others.</p>
SC.912.N.3.3:	<p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p>Remarks/Examples: Recognize that a scientific theory provides a broad explanation of many observed phenomena while a scientific <u>law</u> describes how something behaves.</p>
SC.912.N.3.4:	<p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> <p>Remarks/Examples: Recognize that theories do not become <u>laws</u>, theories explain <u>laws</u>. Recognize that not all scientific <u>laws</u> have accompanying explanatory theories.</p>
SC.912.N.3.5:	<p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p>Remarks/Examples: Describe how <u>models</u> are used by scientists to explain <u>observations</u> of nature.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: <u>Model</u> with mathematics.</p>
SC.912.N.4.1:	<p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p>Remarks/Examples: Recognize that no single universal step-by-step scientific method captures the complexity of doing science. A number of shared values and perspectives characterize a scientific approach.</p> <p>MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p>
SC.912.N.4.2:	<p>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> <p>Remarks/Examples: Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. Discuss ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).</p> <p>Florida Standards Connections: MAFS.K12.MP.1: Make sense of problems and persevere in solving them, and MAFS.K12.MP.2: Reason abstractly and quantitatively.</p>
SC.912.P.8.1:	<p>Differentiate among the four states of matter.</p> <p>Remarks/Examples: Differentiate among the four states of <u>matter</u> (solid, <u>liquid</u>, <u>gas</u> and plasma) in terms of <u>energy</u>, particle <u>motion</u>, and phase transitions. (Note: Currently five states of <u>matter</u> have been identified.)</p>
SC.912.P.8.2:	<p>Differentiate between physical and chemical properties and physical and chemical changes of matter.</p> <p>Remarks/Examples: Discuss <u>volume</u>, compressibility, <u>density</u>, <u>conductivity</u>, malleability, reactivity, molecular composition, <u>freezing</u>, <u>melting</u> and <u>boiling</u> points. Describe simple laboratory techniques that can be used to separate homogeneous and heterogeneous mixtures (e.g. filtration, distillation, chromatography, <u>evaporation</u>).</p>
SC.912.P.8.4:	<p>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</p> <p>Remarks/Examples: Explain that <u>electrons</u>, protons and <u>neutrons</u> are parts of the <u>atom</u> and that the <u>nuclei</u> of <u>atoms</u> are composed of protons and <u>neutrons</u>, which experience <u>forces</u> of attraction and repulsion consistent with their charges and masses.</p> <p>Florida Standards Connections: MAFS.K12.MP.4: <u>Model</u> with mathematics.</p>
SC.912.P.8.5:	<p>Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.</p> <p>Remarks/Examples: Use the <u>periodic table</u> and <u>electron</u> configuration to determine an element's number of valence <u>electrons</u> and its chemical and physical properties. Explain how chemical properties depend almost entirely on the configuration of the outer <u>electron</u> shell.</p>
SC.912.P.8.7:	<p>Interpret formula representations of molecules and compounds in terms of composition and structure.</p> <p>Remarks/Examples: Write chemical formulas for simple covalent (HCl, SO₂, CO₂, and CH₄), ionic (Na⁺ + Cl⁻ + NaCl) and molecular (O₂, H₂O) compounds. Predict the formulas of ionic compounds based on the number of valence electrons and the charges on the ions.</p>

Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.

SC.912.P.8.8:

Remarks/Examples:

Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion.

Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

SC.912.P.8.11:

Remarks/Examples:

Use experimental data to illustrate and explain the pH scale to characterize acid and base solutions. Compare and contrast the strengths of various common acids and bases.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

SC.912.P.10.1:

Remarks/Examples:

Differentiate between kinetic and potential energy. Recognize that energy cannot be created or destroyed, only transformed. Identify examples of transformation of energy: Heat to light in incandescent electric light bulbs Light to heat in laser drills Electrical to sound in radios Sound to electrical in microphones Electrical to chemical in battery rechargers Chemical to electrical in dry cells Mechanical to electrical in generators [power plants] Nuclear to heat in nuclear reactors Gravitational potential energy of a falling object is converted to kinetic energy, then to heat and sound energy when the object hits the ground.

Compare and contrast work and power qualitatively and quantitatively.

SC.912.P.10.3:

Remarks/Examples:

Describe both qualitatively and quantitatively how work can be expressed as a change in mechanical energy, and the concept of power as the rate at which work is done per unit time. Recognize that when a net force, F , acts through a distance on an object of mass, m , work is done on the object.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

SC.912.P.10.4:

Remarks/Examples:

Explain the mechanisms (convection, conduction and radiation) of heat transfer. Explain how heat is transferred (energy in motion) from a region of higher temperature to a region of lower temperature until equilibrium is established. Solve problems involving heat flow and temperature changes by using known values of specific heat and/or phase change constants (latent heat). Explain the phase transitions and temperature changes demonstrated by a heating or cooling curve.

Relate temperature to the average molecular kinetic energy.

SC.912.P.10.5:

Remarks/Examples:

Recognize that the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy.

Distinguish between endothermic and exothermic chemical processes.

SC.912.P.10.7:

Remarks/Examples:

Classify chemical reactions and phase changes as exothermic (release thermal energy) or endothermic (absorb thermal energy).

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

SC.912.P.10.10:

Remarks/Examples:

Recognize and discuss the effect of each force on the structure of matter and the evidence for it.

Differentiate between chemical and nuclear reactions.

SC.912.P.10.12:

Remarks/Examples:

Describe how chemical reactions involve the rearranging of atoms to form new substances, while nuclear reactions involve the change of atomic nuclei into entirely new atoms. Identify real-world examples where chemical and nuclear reactions occur every day.

Differentiate among conductors, semiconductors, and insulators.

SC.912.P.10.14:

Remarks/Examples:

Describe band structure, valence electrons, and how the charges flow or rearrange themselves between conductors and insulators.

Investigate and explain the relationships among current, voltage, resistance, and power.

SC.912.P.10.15:

Remarks/Examples:

Use Ohm's and Kirchhoff's laws to explain the relationships among circuits.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

SC.912.P.10.18:

Remarks/Examples:

Describe the electromagnetic spectrum (i.e., radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays) in terms of frequency, wavelength and energy. Solve problems involving wavelength, frequency, and energy.

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

SC.912.P.10.21:

Remarks/Examples:

Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

SC.912.P.12.2:

Remarks/Examples:

Solve problems involving distance, velocity, speed, and acceleration. Create and interpret graphs of 1-dimensional motion, such as position versus time, distance versus time, speed versus time, velocity versus time, and acceleration versus time where acceleration is constant.
Florida Standards Connections: [MAFS.912.N-VM.1.3](#) (+) Solve problems involving velocity and other quantities that can be represented by vectors.

Interpret and apply Newton's three laws of motion.

<p>SC.912.P.12.3:</p>	<p>Remarks/Examples:</p> <p>Explain that when the net <u>force</u> on an object is zero, no <u>acceleration</u> occurs thus, a moving object continues to move at a constant speed in the same direction, or, if at rest, it remains at rest (Newton's first <u>law</u>). Explain that when a net <u>force</u> is applied to an object its <u>motion</u> will change, or accelerate (according to Newton's second <u>law</u>, $F = ma$). Predict and explain how when one object exerts a <u>force</u> on a second object, the second object always exerts a <u>force</u> of equal magnitude but of opposite direction and <u>force</u> back on the first: $F_1 \text{ on } 2 = -F_1 \text{ on } 1$ (Newton's third <u>law</u>).</p>
<p>SC.912.P.12.4:</p>	<p>Describe how the gravitational force between two objects depends on their masses and the distance between them.</p> <p>Remarks/Examples:</p> <p>Describe Newton's <u>law</u> of universal gravitation in terms of the <u>attraction</u> between two objects, their masses, and the inverse square of the distance between them.</p>
<p>SC.912.P.12.7:</p>	<p>Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.</p> <p>Remarks/Examples:</p> <p>Recognize that regardless of the speed of an observer or source, in a <u>vacuum</u> the speed of <u>light</u> is always c.</p>
<p>SC.912.P.12.10:</p>	<p>Interpret the behavior of ideal gases in terms of kinetic molecular theory.</p> <p>Remarks/Examples:</p> <p>Using the kinetic molecular theory, explain the behavior of <u>gases</u> and the relationship between pressure and <u>volume</u> (Boyle's <u>law</u>), <u>volume</u> and temperature (Charles's <u>law</u>), pressure and temperature (Gay-Lussac's <u>law</u>), and number of particles in a <u>gas</u> sample (Avogadro's <u>hypothesis</u>).</p>
<p>SC.912.P.12.11:</p>	<p>Describe phase transitions in terms of kinetic molecular theory.</p> <p>Remarks/Examples:</p> <p>Explain, at the molecular level, the behavior of <u>matter</u> as it undergoes phase transitions.</p>
<p>SC.912.P.12.12:</p>	<p>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</p> <p>Remarks/Examples:</p> <p>Various factors could include: temperature, pressure, solvent and/or solute <u>concentration</u>, sterics, surface area, and <u>catalysts</u>. The rate of reaction is determined by the <u>activation energy</u>, and the pathway of the reaction can be shorter in the presence of <u>enzymes</u> or <u>catalysts</u>. Examples may include: decomposition of hydrogen peroxide using manganese (IV) oxide nitration of benzene using concentrated sulfuric <u>acid</u> hydrogenation of a C=C double bond using nickel.</p>
<p>LAFS.910.RST.1.1:</p>	<p>Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</p>
<p>LAFS.910.RST.1.2:</p>	<p>Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.</p>
<p>LAFS.910.RST.1.3:</p>	<p>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.</p>
<p>LAFS.910.RST.2.4:</p>	<p>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.</p>
<p>LAFS.910.RST.2.5:</p>	<p>Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).</p>
<p>LAFS.910.RST.2.6:</p>	<p>Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.</p>
<p>LAFS.910.RST.3.7:</p>	<p>Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.</p>
<p>LAFS.910.RST.3.8:</p>	<p>Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.</p>
<p>LAFS.910.RST.3.9:</p>	<p>Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.</p>
<p>LAFS.910.RST.4.10:</p>	<p>By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.</p>
<p>LAFS.910.SL.1.1:</p>	<p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.</p> <ol style="list-style-type: none"> Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.
<p>LAFS.910.SL.1.2:</p>	<p>Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.</p>
<p>LAFS.910.SL.1.3:</p>	<p>Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.</p>
<p>LAFS.910.SL.2.4:</p>	<p>Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.</p>
<p>LAFS.910.SL.2.5:</p>	<p>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</p>
<p>LAFS.910.SL.2.5:</p>	<p>Write arguments focused on discipline-specific content.</p> <ol style="list-style-type: none"> Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s)

LAFS.910.WHST.1.1:	and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.
LAFS.910.WHST.1.2:	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
LAFS.910.WHST.2.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LAFS.910.WHST.2.5:	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LAFS.910.WHST.2.6:	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
LAFS.910.WHST.3.7:	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LAFS.910.WHST.3.8:	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
LAFS.910.WHST.3.9:	Draw evidence from informational texts to support analysis, reflection, and research.
LAFS.910.WHST.4.10:	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
ELD.K12.ELL.SC.1:	English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
ELD.K12.ELL.SI.1:	English language learners communicate for social and instructional purposes within the school setting.
MAFS.912.N-Q.1.1:	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★
MAFS.912.N-Q.1.3:	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

Related Certifications

Science (Secondary Grades 7-12)
Earth/Space Science (Grades 6-12)
Physics (Grades 6-12)
Chemistry (Grades 6-12)
Middle Grades General Science (Middle Grades 5-9)

There are more than 1058 related instructional/educational resources available for this on CPALMS. Click on the following link to access them: <http://www.cpalms.org/Public/PreviewCourse/Preview/13114>