Physics 1 Honors (2003390) Scope and Sequence

Unit	Standards	Suggested Timeframe
Unit 1: Scientific Thought & Process	SC.912.N.1.1, SC.912.N.1.2, SC.912.N.1.5, SC.912.N.1.6, SC.912.N.1.7, SC.912.N.2.2, SC.912.N.2.3, SC.912.N.2.4, SC.912.N.2.5, SC.912.N.3.1, SC.912.N.3.2, SC.912.N.3.3, SC.912.N.3.4, SC.912.N.3.5, SC.912.N.4.1	4 block days and embedded throughout the year
Unit 2: Kinematics/Motion in One Direction	SC.912.P.12.1, SC.912.P.12.2, SC.912.P.12.9	8 block days
Unit 3: Vector Resolution and Motion in Two-Dimensions	SC.912.P.12.1, SC.912.P.12.2, SC.912.P.12.9	8 block days
Unit 4: Newton's Laws of Motion	SC.912.P.12.3, SC.912.P.12.7, SC.912.P.12.8, SC.912.P.10.10	8 block days
Unit 5: Circular Motion, Newton's Law of Gravity, and Rotational Motion	SC.912.P.12.2, SC.912.P.12.4, SC.912.P.12.6, SC.912.E.5.6	10 block days
Unit 6: Impulse and Momentum	SC.912.P.12.5	6 block days
Unit 7: Work and Energy	SC.912.P.10.3, SC.912.P.10.1, SC.912.P.10.2, SC.912.P.10.6, SC.912.P.10.8	6 block days
Unit 8: Wave Properties	SC.912.P.10.18, SC.912.P.10.20, SC.912.P.10.21, SC.912.E.5.2, SC.912.P.10.17, SC.912.E.5.8	7 block days
Unit 9: Light & Geometric Optics	SC.912.P.10.18, SC.912.P.10.21, SC.912.P.12.7, SC.912.P.10.20, SC.912.P.10.22	7 block days
Unit 10: Electricity	SC.912.P.10.1, SC.912.P.10.13, SC.912.P.10.14, SC.912.P.10.15, SC.912.P.10.16	6 block days
Unit 11: Atomic Theory & Nuclear Physics	SC.912.P.8.1, SC.912.P.8.3, SC.912.P.8.4, SC.912.P.10.10	6 block days
Unit 12: Thermal Energy	SC.912.P.10.4, SC.912.P.10.5, SC.912.P.8.1, SC.912.P.10.2, SC.912.P.10.7, SC.912.L.18.12	7 block days

GENERAL NOTES

While the content focus of this course is consistent with the Physics I course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. 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.

Additional standards/ practices that are to be taught in this course:

- 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.
- LAFS.1112.RST.1.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- LAFS.1112.RST.1.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

- LAFS.1112.RST.2.4: 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 11–12 texts and topics.
- LAFS.1112.RST.2.5: Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- LAFS.1112.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
- 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.
- LAFS.1112.RST.3.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- LAFS.1112.RST.3.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- LAFS.1112.RST.4.10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.
- LAFS.1112.SL.1.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11– 12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

    a. 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.

    b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

    c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

    d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.
- LAFS.1112.SL.1.2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
- LAFS.1112.SL.1.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
- LAFS.1112.SL.2.4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
- LAFS.1112.SL.2.5: 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.
- LAFS.1112.WHST.1.1: Write arguments focused on discipline-specific content.

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationship 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.1112.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 complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

  b. Develop the topic thoroughly by selecting the most significant and relevant 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 complex ideas and concepts.

  d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

  e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
- LAFS.1112.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- LAFS.1112.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.1112.WHST.2.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- LAFS.1112.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.1112.WHST.3.8: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- LAFS.1112.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

- LAFS.1112.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.
- MAFS.912.A-CED.1.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R. ★
- 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. ★
- MAFS.912.F-IF.2.4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ★
- MAFS.912.F-IF.3.7: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★
    a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
    b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
    c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
    d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
    e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.
- MAFS.912.G-MG.1.2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★
- MAFS.912.N-VM.1.1: Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., **v, |v|, ||v||, v**).
- MAFS.912.N-VM.1.2: Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
- MAFS.912.N-VM.1.3: Solve problems involving velocity and other quantities that can be represented by vectors.
- MAFS.912.G-GMD.1.3: Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ★
- MAFS.912.S-IC.2.6: Evaluate reports based on data. ★
- MAFS.912.S-ID.1.1: Represent data with plots on the real number line (dot plots, histograms, and box plots). ★
- MAFS.912.S-ID.1.2: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★
- MAFS.912.S-ID.1.3: Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★
- MAFS.912.S-ID.1.4: Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★
- MAFS.912.S-ID.2.5: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★
- MAFS.912.S-ID.2.6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★
    a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.

b. Informally assess the fit of a function by plotting and analyzing residuals.
c. Fit a linear function for a scatter plot that suggests a linear association.

Florida Standards for Mathematical Practice:
Integrate Common Core 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.

English Language Development Standards:

- 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.

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

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?Action=CMS_Document&DocID=139.

CPALMS:
There are more than 1087 related instructional/educational resources, 197 student resources and 121 parent resources available for this course on CPALMS. Click on the following link to access them: http://www.cpalms.org/Public/PreviewCourse/Preview/4317

Physics 1 Honors (2003390)	Unit 1: Approaches to Science	4 block days and embedded throughout the year

Included Standards: SC.912.N.1.1, SC.912.N.1.2, SC.912.N.1.5, SC.912.N.1.6, SC.912.N.1.7, SC.912.N.2.2, SC.912.N.2.3, SC.912.N.2.4, SC.912.N.2.5, SC.912.N.3.1, SC.912.N.3.2, SC.912.N.3.3, SC.912.N.3.4, SC.912.N.3.5, SC.912.N.4.1

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Research and evaluate current scientific experiments. **(SC.912.N.1.1)**
Score 3.0	**The student will understand how to use the appropriate tools in order to design and evaluate a scientific investigation.** **Performs complex skills:** ☐ Explain the difference between an experiment and other types of scientific investigations **(SC.912.N.1.1)** ☐ Compare and contrast the investigations used in Science to those in other disciplines **(SC.912.N.1.1)** ☐ Differentiate between "scientific understandings" and beliefs (**SC.912.N.4.1) (SC.912.N.3.3) (SC.912.N.3.4) (SC.912.N.3.5)** ☐ Apply the metric system to numbers and quantities in an experiment or other types of scientific investigation **(SC.912.N.1.1)** ☐ Distinguish between accuracy and precision (**SC.912.N.1.1)** ☐ Conduct investigations using a metric ruler, a Vernier caliper, and a micrometer caliper **(SC.912.N.1.1)** ☐ Distinguish between independent variables, dependent variables, controls, and variables that are held constant. **(SC.912.N.1.1)** ☐ Compare and contrast the relationships between independent and dependent variables on a graph **(SC.912.N.1.6)** ☐ Develop a hypothesis from given information and be able to determine what data should be collected to test that hypothesis **(SC.912.N.1.1) (SC.912.N.3.2)** ☐ Create and evaluate Best Fit graphs (**SC.912.N.1.6)** ☐ Evaluate common relationships in graphs **(SC.912.N.1.6)** ☐ 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. **(SC.912.N.3.1)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology, such as:** hypothesis, observation, research, scientific method, trial, conclusion, constant, data, variables, formal laboratory report, results, independent variable, dependent variable, pseudoscience, line graph, best fit graph, direct variation, inverse variation, apparatus, accuracy, precision, inferring, empirical evidence, cause and effect, metric system, model, computer simulation, theory, law **Performs basic skills:** ☐ Identify experiments and other types of scientific investigations (**SC.912.N.1.1) (SC.912.N.1.5) (SC.912.N.2.4)** ☐ Explain that science is based on evidence based on facts (**SC.912.N.1.1) (SC.912.N.2.4) (SC.912.N.2.5)** ☐ Explain how inferences are made from observations **(SC.912.N.2.5)** ☐ Explain how repetition and replication are important in science **(SC.912.N.2.5)** ☐ Identify and describe the steps of the scientific methods (**SC.912.N.1.1) (SC.912.N.1.2) (SC.912.N.1.7) (SC.912.N.2.2)** ☐ Use the metric system in experiments and other types of scientific investigations **(SC.912.N.1.1)** ☐ Use dimensional analysis to check correctness of units and when breaking down answers **(SC.912.N.1.1) (SC.912.N.2.5)** ☐ Use scientific notation when performing and solving arithmetic operations**(SC.912.N.1.1) (SC.912.N.1.6) (SC.912.N.2.4)** ☐ Define accuracy and precision**(SC.912.N.1.1) (SC.912.N.2.5)** ☐ Use a metric ruler, a Vernier caliper and a micrometer caliper in an experiment and other types of scientific investigations **(SC.912.N.1.1)** ☐ Define precision as applied to measured quantities (**SC.912.N.1.1)** ☐ Graph the relationship between independent and dependent variables**(SC.912.N.1.1)** ☐ Draw a Best Fit graph **(SC.912.N.1.1) (SC.912.N.1.6)** ☐ List common relationships in graphs **(SC.912.N.1.6)** ☐ Identify examples of pseudoscience (such as astrology, phrenology) in society. **(SC.912.N.2.3)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Physics 1 Honors (2003390)	Unit 2: Kinematics/Motion in One Direction	Suggested Length of Unit: 8 block days

Included Standards: SC.912.P.12.1, SC.912.P.12.2, SC.912.P.12.9

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Research how the components of motion relate to real life applications (SC.912.P.12.2)
Score 3.0	**The student will be able to represent and interpret motion involving position and time in one-dimensional kinematics.** **Performs complex skills:** ☐ distinguish between vector quantities and scalar quantities (**SC.912.P.12.1)** ☐ evaluate the correct coordinate systems for motion problems (**SC.912.P.12.2)** ☐ explain an object's position and/or displacement by using a motion diagram (**SC.912.P.12.2)** ☐ construct and interpret position-time graphs for moving objects(**SC.912.P.12.2)** ☐ construct and interpret graphs of velocity vs. time (**SC.912.P.12.1)** ☐ differentiate between speed and velocity (**SC.912.P.12.2)** ☐ compare and contrast graphical representations of accelerated and non-accelerated motions (**SC.912.P.12.2)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology, such as:** frame of reference, scalar, distance, speed, energy, mass, work, vector, displacement, velocity, acceleration, force, kinematics, air resistance **Performs basic skills:** ☐ recognize a position-time graph (**SC.912.P.12.2)** ☐ identify quantities that can be interpreted from a position-time graph(**SC.912.P.12.1)** ☐ match a position-time graph to a description of motion (**SC.912.P.12.2)** ☐ state the definition of speed and of velocity (**SC.912.P.12.2)** ☐ identify which quantities are scalar and which quantities are vector (**SC.912.P.12.1)** ☐ explain the difference between scalar and vector quantities (**SC.912.P.12.1)** ☐ solve problems involving velocity and other quantities that can be represented by vectors (**SC.912.P.12.2)** ☐ describe motion in terms of changing velocity (**SC.912.P.12.2)** ☐ solve problems involving parallel vectors (**SC.912.P.12.2)** ☐ apply kinematic equations to calculate distance, time, or velocity under conditions of constant acceleration (**SC.912.P.12.9)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

St. Lucie PUBLIC SCHOOLS

Physics 1 Honors (2003390)	Unit 3: Vector Resolution and Motion in Two Dimensions	Suggested Length of Unit: 8 block days

Included Standards: SC.912.P.12.1, SC.912.P.12.2, SC.912.P.12.9

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Generate and test how to use vectors and the Kinematic Equations to predict the range and the height of a projectile that is launched at varying angles. (SC.912.P.12.1)
Score 3.0	**The student will be able to describe, explain, and predict the behavior of objects moving through two dimensions.** **Performs complex skills:** ☐ distinguish between the magnitude and the direction of a given vector **(SC.912.P.12.1)** ☐ resolve vectors into components using sine and cosine functions **(SC.912.P.12.2)** ☐ explain the different types of curvilinear motion **(SC.912.P.12.2)** ☐ distinguish between the horizontal and vertical components of projectile motion **(SC.912.P.12.2)** ☐ solve projectile motion problems **(SC.912.P.12.2)** ☐ solve relative velocity problems **(SC.912.P.12.2)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology, such as:** magnitude, resultant, scalar, vector, component, sine, cosine, tangent, relative motion, projectile, range, trajectory, curvilinear, Pythagorean Theorem, parabola **Performs basic skills:** ☐ identify which quantities are scalar and vector quantities **(SC.912.P.12.1)** ☐ define the different types of curvilinear motion **(SC.912.P.12.2)** ☐ recognize examples of projectile motion **(SC.912.P.12.2)** ☐ explain how in projectile motion the horizontal and vertical motions are independent of each other **(SC.912.P.12.9)** ☐ describe the path of a projectile as a parabola **(SC.912.P.12.2)** ☐ give the value of the horizontal and the vertical acceleration for projectile motion **(SC.912.P.12.2)** ☐ list the horizontal and vertical forces acting on an object in projectile motion (**SC.912.P.12.2)** ☐ solve problems involving both parallel and perpendicular vectors **(SC.912.P.12.1)** ☐ use the Pythagorean Theorem and the tangent function to find the magnitude and direction of a resultant vector given vectors that are at right angles to each other**(SC.912.P.12.2)** ☐ solve projectile motion problems (**SC.912.P.12.2)** ☐ solve relative velocity problems (**SC.912.P.12.2)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Physics 1 Honors (2003390)	Unit 4: Newton's Laws of Motion	Suggested Length of Unit: 8 block days

Included Standards: SC.912.P.12.3, SC.912.P.12.7, SC.912.P.12.8, SC.912.P.10.10

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Research perpetual motion machines **(SC.912.P.12.3)**
Score 3.0	**The student will be able to describe, explain, and predict the behavior of objects using Newton's Three Laws of Motion.** **Performs complex skills:** ☐ Construct and interpret free-body diagrams **(SC.912.P.12.3)** ☐ Interpret and apply Newton's three Laws of Motion **(SC.912.P.12.3)** ***(SC.912.P.12.8)*** ☐ Compare and contrast weight and mass of an object **(SC.912.P.12.7)** ☐ Compare the magnitude and range of the four fundamental forces **(SC.912.P.10.10)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology, such as:** action-reaction pair, weight, mass, force, equilibrium, inertia, tension, Newton's Laws, coefficient of friction, friction, inclined plane, terminal velocity, centripetal, tangential, elliptical orbits, geocentric, heliocentric, Kepler's Law, Universal Gravitational constant, nuclear, electromagnetic, weak **Performs basic skills:** ☐ Describe how force affects the motion of an object **(SC.912.P.12.3)** ☐ Explain the difference between mass and weight **(SC.912.P.12.7)** ☐ Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light. **(SC.912.P.12.8)** ☐ Recognize that the speed of light in any reference frame is the central postulate of the Special Theory of Relativity. As speeds approach zero, Special Relativity tends towards equivalence with Newton's Laws of Motion. **(SC.912.P.12.8)** ☐ Identify examples of Newton's three Laws of Motion **(SC.912.P.12.3)** ☐ label the forces on a free-body diagram **(SC.912.P.12.3)** ☐ solve problems using Newton's Second Law with and without friction**(SC.912.P.12.3)** ☐ Identify the direction and magnitude of a Normal Force **(SC.912.P.12.3)** ☐ Calculate frictional forces using coefficients of friction**(SC.912.P.12.7)** ☐ Identify the four fundamental forces **(SC.912.P.10.10)** ☐ Describe the magnitude and range of each of the four fundamental forces **(SC.912.P.10.10)** ☐ Describe a manifestation of each of the four fundamental forces **(SC.912.P.10.10)** ☐ Describe gravitational fields **(SC.912.P.10.10)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Physics 1 Honors (2003390)	Unit 5: Circular Motion, Newton's Law of Gravity, and Rotational Motion	Suggested Length of Unit: 10 days

Included Standards: SC.912.P.12.2, SC.912.P.12.4, SC.912.P.12.6, SC.912.E.5.6

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Research how a person's center of gravity affects their athletic performance. **(SC.912.P.12.4)**
Score 3.0	**The student will be able to describe, explain, and predict the behavior of objects that are in rotational motion.** **Performs complex skills:** ☐ compare angular displacement to circular motion **(SC.912.P.12.2)** ☐ calculate angular displacement, angular velocity, and angular acceleration **(SC.912.P.12.2)** ☐ solve problems involving angular rotation **(SC.912.P.12.2)** ☐ determine the factors that affect torque and solving for torque **(SC.912.P.12.4)** ☐ determine the factors that affect the moment of inertia **(SC.912.P.12.4)** ☐ determine the center of mass of a system **9SC.912.P.12.4)** ☐ apply the conditions of rotational equilibrium in a problem **(SC.912.P.12.4)** ☐ apply Newton's Law of Universal Gravitation and Centripetal force to demonstrate Kepler's 3rd Law **(SC.912.E.5.6)** ☐ distinguish between horizontal and vertical circular motion **(SC.912.P.12.2)** ☐ solve centripetal motion problems **(SC.912.P.12.4)** ☐ explain why a centrifugal force is a fictitious force **(SC.912.P.12.4)** ☐ Describe how the gravitational force between two objects depends on their masses and the distance between them **(SC.912.P.12.4)** ☐ Describe Newton's Law of Universal Gravitation in terms of the attraction between two objects, their masses, and the inverse square of the distance between them **(SC.912.P.12.4)** ☐ Qualitatively apply the concept of angular momentum. **(SC.912.P.12.6)** ☐ Explain that angular momentum is rotational analogy to linear momentum (e.g. because angular momentum is conserved, a change in the distribution of mass about the axis of rotation will cause a change in the rotational speed [ice skater spinning]). **(SC.912.P.12.6)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology, such as:** Tangential velocity, centripetal, elliptical orbits, Kepler's Laws, angular displacement, angular velocity, angular acceleration, torque, inertia, equilibrium, satellite, rotational equilibrium, rotational inertia, moment of inertia **Performs basic skills:** ☐ describe angular displacement, angular velocity and angular acceleration **(SC.912.P.12.2)** ☐ use the equations of rotational motion to find values for angular displacement, angular velocity and angular acceleration **(SC.912.P.12.2)** ☐ define torque and moment of inertia **(SC.912.P.12.4)** ☐ define center of mass **(SC.912.P.12.4)** ☐ solve centripetal motion problems **(SC.912.P.12.4)** ☐ use the equation of rotational equilibrium to balance a system **(SC.912.P.12.4)** ☐ Explain how the apparent existence of an outward (centrifugal) force in circular motion can be explained as inertia resisting the Centripetal force **(SC.912.P.12.2)** ☐ Describe Kepler's Three Laws of Planetary Motion **(SC.912.E.5.6)** ☐ Use Kepler's Laws to relate the period of orbit to the radius of orbit for a satellite **(SC.912.E.5.6)** ☐ Explain how Kepler's Law works equally for natural and man-made satellites **(SC.912.E.5.6)** ☐ Calculate the gravitational force between two objects **(SC.912.P.12.4)** ☐ Explain how the gravitational force between two objects would be affected if the distance between the two objects doubled, was cut in half, etc. **(SC.912.P.12.4)** ☐ Explain how the gravitational force between two objects would be affected if the mass between the two objects doubled, was cut in half, etc. **(SC.912.P.12.4)** ☐ Explain how Kepler's Law relates to the Law of Universal Gravitation **(SC.912.E.5.6)** ☐ Explain how weightlessness relates to objects in free fall **(SC.912.P.12.2) (SC.912.P.12.4)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Physics 1 Honors (2003390)	Unit 6: Impulse and Momentum	Suggested Length of Unit: 6 block days

Included Standards: SC.912.P.12.5

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Conduct experiments to test the Law of Conservation of Energy and the Law of Conservation of Momentum (SC.912.P.12.5)
Score 3.0	**The student will be able to describe, explain, and predict the behavior of objects using the Conservation of Momentum.** **Performs complex skills:** ☐ define momentum and using the definition in to analyze collisions (**SC.912.P.12.5)** ☐ determine the impulse given to an object (**SC.912.P.12.5)** ☐ describe why the two factors of impulse are important (**SC.912.P.12.5)** ☐ define angular momentum of an object and relating its conservation to real world situations (**SC.912.P.12.5)** ☐ explain how Newton's 3rd Law is a special case of the Conservation of Momentum (**SC.912.P.12.5)** ☐ solve collision problems in one dimension using the conservation of momentum (**SC.912.P.12.5)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology, such as:** impulse, momentum, closed system, elastic collision, inelastic collision **Performs basic skills:** ☐ define momentum and impulse (**SC.912.P.12.5)** ☐ explain how momentum and impulse are related (**SC.912.P.12.5)** ☐ Describe how the conservation of Momentum is obvious from real world situations. (**SC.912.P.12.5)** ☐ describe a situation where angular momentum is conserved (**SC.912.P.12.5)** ☐ solve a collision problem using conservation of momentum (**SC.912.P.12.5)** ☐ calculate the impulse applied to an object (**SC.912.P.12.5)** ☐ calculate the momentum and the change in momentum of an object(**SC.912.P.12.5)** ☐ use the Impulse-Momentum Theorem to solve problems(**SC.912.P.12.5)** ☐ determine the changes in kinetic energy during perfectly elastic conditions(**SC.912.P.12.5)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Physics 1 Honors (2003390)	Unit 7: Work and Energy	Suggested Length of Unit: 6 block days

Included Standards: SC.912.P.10.3, SC.912.P.10.1, SC.912.P.10.2, SC.912.P.10.6, SC.912.P.10.8

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Design and test experiments related to the Law of Conservation of Energy. (**SC.912.P.10.2**)
Score 3.0	**The student will understand the relationship between energy and work and be able to solve problems using these concepts.** **Performs complex skills:** ☐ analyze the relationship between work and energy (**SC.912.P.10.1**) ☐ interpret the transfer of energy in a system (**SC.912.P.10.2**) ☐ differentiate between the various forms of energy(**SC.912.P.10.1**) ☐ distinguish between kinetic and potential energy(**SC.912.P.10.1**) ☐ classify different forms of potential energy(**SC.912.P.10.1**) ☐ calculate kinetic energy and potential energy from a given situation(**SC.912.P.10.2**) ☐ differentiate among open, closed, and isolated systems (**SC.912.P.10.2**) ☐ analyze and solve motion and force problems using the Conservation of Energy(**SC.912.P.10.1**) (**SC.912.P.10.2**) ☐ apply the Work-Energy Theorem to the solution of problems (**SC.912.P.10.1**) ☐ distinguish between compound machines and simple machines(**SC.912.P.10.1**) ☐ construct a Rube Goldberg Machine using five simple machines (**SC.912.P.10.1**) ☐ discriminating between ideal and real machines in terms of efficiency(**SC.912.P.10.1**) ☐ Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum. (**SC.912.P.10.6**) ☐ Construct and interpret potential energy diagrams for endothermic and exothermic chemical reactions, and for rising or falling objects. Describe the transformation of energy as a pendulum swings. (**SC.912.P.10.6**) ☐ Explain entropy's role in determining the efficiency of processes that convert energy to work. (**SC.912.P.10.8**) **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology, such as:** work, energy, joule, potential energy, kinetic energy, mechanical energy, open system, closed system, isolated system, spring constant, conservation of energy, elastic potential energy, Work-Energy theorem, power, watt, machines, efficient, gravitational potential energy **Performs basic skills:** ☐ describe the relationship between work and energy(**SC.912.P.10.1**) ☐ calculate the net work done on an object when many forces are applied to an object (**SC.912.P.10.1**) (**SC.912.P.10.2**) ☐ calculate the power when work is done on an object (**SC.912.P.10.1**) (**SC.912.P.10.2**) ☐ explain the effect of machines on work and power(**SC.912.P.10.2**) ☐ identify different forms of energy(**SC.912.P.10.1**) (**SC.912.P.10.3**) ☐ explain that the total energy in an isolated system is a conserved quantity (**SC.912.P.10.2**) ☐ identify the transfer of energy in a system (**SC.912.P.10.2**) ☐ calculate kinetic energy and potential energy from given equations(**SC.912.P.10.1**) (**SC.912.P.10.2**) ☐ solve motion and force problems using the Conservation of Energy(**SC.912.P.10.1**) (**SC.912.P.10.2**) ☐ Use the Work-Energy Theorem to solve problems (**SC.912.P.10.1**) ☐ describe compound machines in terms of simple machines (**SC.912.P.10.1**) ☐ identify examples of compound machines and simple machines(**SC.912.P.10.1**) ☐ describe a Rube Goldberg Machine (**SC.912.P.10.1**) ☐ identify reasons that a machine cannot be 100% efficient (**SC.912.P.10.1**) ☐ Recognize that there is a natural tendency for systems to move in a direction of disorder or randomness (entropy). Describe entropy as a quantity that measures the order or disorder of a system and that this quantity is larger for a more disordered system. (**SC.912.P.10.8**) **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Physics 1 Honors (2003390)	Unit 8: Wave Properties	Suggested Length of Unit: 7 blocked days

Included Standards: SC.912.P.10.18, SC.912.P.10.20, SC.912.P.10.21, SC.912.E.5.2, SC.912.P.10.17, SC.912.E.5.8

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Generate and text experiments that explain how the speed of sound is effected at various temperatures (**SC.912.P.10.20)**
Score 3.0	**The student will understand the theory of electromagnetism and be able to describe the measurable properties of waves.** **Performs complex skills:** ☐ Compare and contrast the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy. (**SC.912.P.10.18)** ☐ Compare and contrast mechanical and electromagnetic waves. (**SC.912.P.10.18)** ☐ Compare and contrast transverse and longitudinal waves. (**SC.912.P.10.20)** ☐ Explain the relationships among the measurable properties of waves (**SC.912.P.10.20)** ☐ Explain how the properties of wave change when the wave moves from one medium to another(**SC.912.P.10.20)** ☐ Distinguish between transverse and longitudinal waves in mechanical media, such as springs and ropes, and on Earth (seismic waves) (**SC.912.P.10.21)** ☐ Differentiate between constructive and destructive interference (**SC.912.E.5.2)** ☐ Explain the physical properties of sound compared to the physiological properties of sound (frequency vs. pitch, amplitude vs. loudness, harmonic content vs. quality) (**P.10.20)** ☐ Compare the speed of sound in various media (**SC.912.E.5.2)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology, such as:** rectilinear propagation, reflection, refraction, diffraction, interference, crest, trough, longitudinal wave, transverse wave, mechanical wave, electromagnetic wave, wavelength, simple harmonic motion, Hooke's Law, restoring force, Node, standing wave, resonance, compression, rarefaction, pitch, frequency, amplitude, Doppler Effect **Performs basic skills:** ☐ Identify the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy. (**SC.912.P.10.18)** ☐ 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. (**SC.912.P.10.18)** ☐ Solve problems involving wavelength, frequency, and energy. (**SC.912.P.10.18)** ☐ Identify different types of waves including mechanical, electromagnetic, transverse, and longitudinal (**SC.912.P.10.20)** ☐ List examples of the five properties of waves. (**SC.912.P.10.20)** ☐ Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) (**SC.912.P.10.20)** (**SC.912.P.10.21)** ☐ Explain the relationships between the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection and refraction) (**SC.912.P.10.20)** ☐ Recognize that the source of all waves is vibration and waves carry energy from one place to another (**SC.912.P.10.18)** ☐ Give examples of constructive and destructive interference **(SC.912.E.5.2)** ☐ Identify nodes and antinodes of standing waves. (**SC.912.P.10.20) (SC.912.E.5.2)** ☐ Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or the receiver.(**P.10.21)**(**P.10.20)**(**P.10.18)** ☐ Explain how sound waves are produced (**SC.912.P.10.20)** ☐ Describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates (**SC.912.P.10.20)** (**SC.912.P.10.21)** ☐ Identify the Doppler Effect and its ramifications to all wave types(**SC.912.P.10.20) (SC.912.E.5.2)** ☐ Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect) (**SC.912.P.10.20)** (**SC.912.P.10.21)** ☐ Identify patterns in the organization and distribution of matter in the universe and the forces that determine them. (**SC.912.E.5.2)** ☐ Describe how Red Shift, explained by the Doppler effect, indicates that the universe is expanding and is evidence for the Big Bang Theory**(E.5.2)**(**P.10.20)**(**P.10.21)** ☐ Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools. **(SC.912.E.5.8)** ☐ Describe how frequency is related to the characteristics of electromagnetic radiation and recognize how spectroscopy is used to detect and interpret information from electromagnetic radiation sources. **(SC.912.E.5.8)** ☐ Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields. **(SC.912.P.10.17)** ☐ Recognize that an oscillating charge creates an oscillating electric field which gives rise to electromagnetic waves. Recognize a changing magnetic field makes an electric field, and a changing electric field makes a magnetic field, and these phenomena are expressed mathematically through the Faraday law and the Ampere-Maxwell law. **(P.10.17)** **No major errors or omissions regarding the score 2.0 content**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Physics 1 Honors (2003390)	Unit 9: Light and Geometric Optics	Suggested Length of Unit: 7 block days

Included Standards: SC.912.P.10.18, SC.912.P.10.21, SC.912.P.12.7, SC.912.P.10.20, SC.912.P.10.22

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Research scientific and other applications of convex and concave mirrors and lenses. (**SC.912.P.10.22)**
Score 3.0	**The student will understand the speed of light and be able to explain reflection and refraction of light waves.** **Performs complex skills:** ☐ Compare and contrast the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy. (**SC.912.P.10.18)** ☐ Construct ray diagrams and use thin lens mirror equations to locate the images formed by lenses and mirrors. (**SC.912.P.10.22)** ☐ Demonstrate the mirror/lens equation as used for converging and diverging lenses (**SC.912.P.10.22)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology, such as:** electromagnetic spectrum, inverse square law, speed of light, dispersion, lens, mirror, concave, convex, converging, diverging, real image, virtual image, magnification, focal length, principal axis, center of curvature, law of reflection, law of refraction, index of refraction **Performs basic skills:** ☐ Identify the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy. (**SC.912.P.10.18)** ☐ 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. (**SC.912.P.10.18)** (**SC.912.P.10.20)** (**SC.912.P.10.21)** ☐ List the bands of the electromagnetic spectrum and be able to give real world examples. (**SC.912.P.10.18)** (**SC.912.P.10.20)** (**SC.912.P.10.21)** ☐ Calculate the frequency or wavelength of electromagnetic radiation(**SC.912.P.10.18)** ☐ Recognize that frequency of visible light is represented by its color **(SC.912.P.12.7)** ☐ Recognize that nothing travels faster than the speed of light in a vacuum which is the same for observers no matter how they or the light source are moving (**SC.912.P.12.7)** ☐ Recognize that regardless of the speed of an observer or source, in a vacuum the speed of light is always c. **(SC.912.P.12.7)** ☐ Use examples such as converging/diverging lenses and convex/concave mirrors. (**SC.912.P.10.22)** ☐ Use a ray diagram to determine the approximate location and size of the image (**SC.912.P.10.22)** ☐ Use the mirror equation to obtain numerical information about image distance and image size (**SC.912.P.10.22)** ☐ Identify which direction light will bend when it passes from one medium to another **(SC.912.P.12.7)** ☐ Identify the density of a material based on the refraction of light as it changes media (**SC.912.P.10.20) (SC.912.P.12.7)** ☐ Calculate the magnification of lenses (**SC.912.P.10.22)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Physics 1 Honors (2003390)	Unit 10: Electricity	Suggested Length of Unit: 6 block days

Included Standards: SC.912.P.10.1, SC.912.P.10.13, SC.912.P.10.14, SC.912.P.10.15, SC.912.P.10.16

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Investigate the configuration of static charges and be able to relate them to the electric field, electric force, and electric potential energy. (**SC.912.P.10.13)**
Score 3.0	**The student will understand the configuration of static charges and be able to relate them to the electric field, electric force, and electric potential energy.** **Performs complex skills:** ☐ Differentiate among the various forms of energy and recognize that they can be transformed from one form to others. **(SC.912.P.10.1)** ☐ Distinguish the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy (**SC.912.P.10.13)** ☐ Differentiate between conductors, semi-conductors, and insulators. **(SC.912.P.10.14)** ☐ Describe band structure valence electrons, and how the charges flow or rearrange themselves between conductors and insulators. **(SC.912.P.10.14)** ☐ Differentiate the relationships among current, voltage, resistance, and power. **(SC.912.P.10.15)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology, such as:** Energy transformations, electrical energy, static charges, electric field, electric force, electric potential, electric potential energy, Coulomb's Law, Ohm's Law, Kirchhoff's Law, stationary charge, gravitational force, conductors, semi-conductors, insulators, band structure, valence electrons, current, voltage, resistance, power, circuits, series circuits, parallel circuits, induction, and conduction. **Performs basic skills:** ☐ Using Coulomb's Law determine the force on a stationary charge due to other stationary charges and explain that it is many times greater than the gravitational force. (**SC.912.P.10.13)** ☐ Recognize the relationships between forces and their associated potential energies. (**SC.912.P.10.13)** ☐ Recognize that the electric field is directly related to the rate of change of the electric potential from point to point in space. (**SC.912.P.10.13)** ☐ Identify examples of conductors, semi-conductors, and insulators. (**SC.912.P.10.14)** ☐ Use Ohm's and Kirchhoff's laws to explain the relationships among circuits. (**SC.912.P.10.15)** ☐ Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies. (**SC.912.P.10.16)** ☐ Explain that moving electric charges produce magnetic forces and moving magnets produce electric forces. (**SC.912.P.10.16)** ☐ Recognize the Lorentz force is the force on a point charge due to electromagnetic fields and occurs in many devices, including mass spectrometers. **(SC.912.P.10.16)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Physics 1 Honors (2003390)	Unit 11: Atomic Theory & Nuclear Physics	Suggested Length of Unit: 6 block days

Included Standards: SC.912.P.8.1, SC.912.P.8.3, SC.912.P.8.4, SC.912.P.10.10

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Investigate the relationship between four states of matter (solid, liquid, gas, and plasma) in terms of energy particle motion and phase transitions. (SC.912.P.8.1) ☐ Research how Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and "gold foil" experiments, and Bohr (planetary model of atom) lead to the modern atomic theory (SC.912.P.8.3)
Score 3.0	**The student will understand the scientific theory of atoms and be able to describe changes in the atomic model that were necessitated by experimental evidence.** **Performs complex skills:** ☐Differentiate between the four states of matter (solid, liquid, gas, and plasma) in terms of energy particle motion and phase transitions. **(SC.912.P.8.1)** ☐Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence. **(SC.912.P.8.3)** ☐Evaluate how Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and "gold foil" experiments, and Bohr (planetary model of atom) lead to the modern atomic theory **(SC.912P.8.3)** ☐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. **(SC.912.P.8.4)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology, such as:** solid, liquid gas, plasma, particle motion, phase transition, atomic theory, atomic model, electron, neutron, proton, nucleus, Dalton, Thomson, Rutherford, Bohr, and experimental evidence **Performs basic skills:** ☐ Identify example of the four states of matter (solid, liquid, gas, and plasma) in terms of energy particle motion and phase transitions. **(SC.912.P.8.1)** ☐ Describe the development and historical importance of atomic theory from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus and "gold foil" experiments, and Bohr (planetary model of atom) **(SC.912.P.8.3)** ☐ Explain that electrons, protons and neutrons are parts of the atom and that the nuclei of atoms are composed of protons and neutrons, which experience forces of attraction and repulsion consistent with their charges and masses. **(SC.912.P.8.4)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.

Physics 1 Honors (2003390)	Unit 12: Thermal Energy	Suggested Length of Unit: 7 block days

Included Standards: SC.912.P.10.4, SC.912.P.10.5, SC.912.P.8.1, SC.912.P.10.2, SC.912.P.10.7, SC.912.L.18.12

Score 4.0	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught.** ☐ Conduct experiments to test properties of aqueous solutions in terms of the kinetic molecular theory and intermolecular forces. **(SC.912.P.10.4)**
Score 3.0	**The student will understand how temperature relates to the average molecular energy and be able to explain the connection of heat to change in temperature or states of matter.** **Performs complex skills:** ☐ Compare and contrast temperature scales (Celsius, Fahrenheit, Kelvin, and Rankine) **(SC.912.P.10.5)** ☐ Relate temperature to the kinetic energy of atoms in a molecule **(SC.912.P.10.5)** ☐ Differentiate between heat and temperature **(SC.912.P.10.4)** ☐ Interpret the various sections of a heating curve **(SC.912.P.10.4)** ☐ Differentiate between open, closed, and isolated systems **(SC.912.P.10.2)** ☐ Differentiate among the four states of matter **(SC.912.P.8.1)** ☐ Distinguish between endothermic and exothermic chemical processes. **(SC.912.P.10.7)** **The student exhibits no major errors or omissions regarding the score 3.0 content.**
Score 2.0	**The student:** **Recognizes or recalls specific terminology, such as:** temperature scale, convection, conduction, radiation, heat, thermal equilibrium, calorimetry, heat of fusion, heat of vaporization, phase change, specific heat, entropy, internal energy **Performs basic skills:** ☐ Identify different temperature scales (Celsius, Fahrenheit, Kelvin, and Rankine) and their respective units **(SC.912.P.10.5)** ☐ Describe the temperature changes of two objects as they reach thermal equilibrium **(SC.912.P.10.4)** ☐ Describe the differences between heat and temperature ☐ Explain the transfer of heat **(SC.912.P.10.4)** ☐ Describe solid, liquid, and gas phases in terms of molecular motion **(SC.912.P.10.5)** ☐ Solve problems involving heat and cooling curves and phase change **(SC.912.P.10.4)** ☐ Solve problems with specific heat capacity **(SC.912.P.10.4)** ☐ Identify systems as open, closed, or isolated **(SC.912.P.10.2)** ☐ Identify and describe the four states of matter **(SC.912.P.8.1)** ☐ Explain how the total energy in an isolated system is a conserved quantity **(SC.912.P.10.2) (SC.912.P.10.4)** ☐ Solve problems involving the equation PV/T = a constant **(SC.912.P.10.4)** ☐ Classify chemical reactions and phase changes as exothermic (release thermal energy) or endothermic (absorb thermal energy). **(SC.912.P.10.7)** ☐ 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. **(SC.912.L.18.12)** **No major errors or omissions regarding the score 2.0 content.**
Score 1.0	With help, I know some of 2.0 and 3.0.
Score 0.0	Even with help, I am unable to understand.