MOORESTOWN TOWNSHIP PUBLIC SCHOOLS
MOORESTOWN, NEW JERSEY

Moorestown High School
Science Department

Standard Physical Science
Grades 9-12

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Prepared by: Allen Kolchinsky
Supervisor: Gavin Quinn

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Course Description and Fundamental Concepts

The study of Physical Science reveals the connectivity of the Universe. The Standard Level Physical Science Course is devoted to topics that fall within the general curricula of Physics and Chemistry. This course is based upon the understanding that students are diverse in their backgrounds, their abilities levels, preferred learning styles and the extent to which they are proficient in each type of intelligence. With respect to this understanding, the instruction is modified. A variety of teaching methods are utilized in this course, but not limited to small group work, experimentation, demonstrations, class discussions, observations, questioning, problem solving, and lecture. The pace of this course will allow students more time to develop conceptual understanding.

Our Standard Physical Science course incorporates the ***New Jersey Student Learning Standards for Science,*** allowing our students to explore topics more completely using scientific and engineering practices to foster deeper thought and problem solving, as integral members of our community. In the process of discovering and understanding the Disciplinary Core Ideas, students will search for and/or employ the following cross cutting concepts: Patterns, Cause and Effect, Scale, Proportion and Quantity, Systems and System Models, Energy and Matter, Structure and Function, and Stability and Change.

Students partaking in this Physical Science course will encounter the following areas of study organized into two broad Foci:
The Physics Focus: Measurement, Size and Scale, Classical Mechanics (Kinematics and Forces), Energy, Waves, Electricity, and Magnetism
The Chemistry Focus: Matter and States of Matter, Elements and the Periodic Table, Atomic Theory, Bonds and Compounds, and Reactions.

Because of the dual disciplinary content of this course there are two unique characteristics of this course that should be maintained with respect to balancing the depth with the breadth of the course:

1. This course maintains a physics first approach, as many of the concepts contained in the physics portion of the curriculum serve as a basis for understanding the happenings found in the chemistry portion of the curriculum.
2. To prevent forcing students into a pace that could prevent them from the opportunity to develop deeper understandings, pace will be subject to modification as needed. To this end, the Physics Focus will end at the conclusion of the third marking period, and the Chemistry Focus will proceed for the fourth marking period.

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New Jersey Student Learning Standards (NJSLS)

Subject/Content Standards *Include grade appropriate subject/content standards that will be addressed*

Standard #	Standard Description
HS-PS1	
HS-PS1-1	*Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.*
HS-PS1-2	*Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.*
HS-PS1-3	*Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.*
HS-PS1-4	*Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.*
HS-PS1-5	*Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.*
HS-PS1-6	*Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.*
HS-PS1-7	*Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.*
HS-PS1-8	*Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.*
HS-PS2	

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HS-PS2-1	*Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. [*
HS-PS2-2	*Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.*
HS-PS2-3	*Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*
HS-PS2-4	*Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.*
HS-PS2-5	*Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.*
HS-PS2-6	*Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.*
HS-PS3	
HS-PS3-1	*Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known..*
HS-PS3-2	*Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).*
HS-PS3-3	*Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*
HS-PS3-4	*Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).*
HS-PS3-5	*Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.*

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HS-PS4	
HS-PS4-1	*Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.*
HS-PS4-2	*Evaluate questions about the advantages of using a digital transmission and storage of information.*
HS-PS4-3	*Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.*
HS-PS4-4	*Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.*
HS-PS4-5	*Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.*
ETS1 Engineering Design	
HS-ETS1-1	*Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.*
HS-ETS1-2	*Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.*
HS-ETS1-3	*Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.*
HS-ETS1-4	*Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.*

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English Companion Standards

List grade-level appropriate companion standards for History, Social Studies, Science and Technical Subjects (CTE/Arts) 6-12. English Companion Standards are required in these subject/content areas.

Unit Addressed	Standard #	Standard Description
8	**RST.9-10.8**	*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. (HS-PS4-2),(HS-PS4-3),(HS-PS4-4)*
6,7,8,9	**RST.11-12.1**	*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. (HS-PS1-3), (HS-PS1-5),(HS-PS2-1),(HS-PS2-6),(HS-PS3-4)(HS-PS4-2),(HS-PS4-3),(HS-PS4-4)*
8	**RST.11-12.7**	*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. (HS-PS4-!),(HS-PS2-1),(HS-PS4-4)*
3	**RST.11-12.8**	*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. (HS-PS4-2),(HS-PS4-3),(HS-PS4-4)*
1,2,3,4,9	**WHST.9-12. 2**	*Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS1-2), (HS-PS1-5),(HS-PS2-6),(HS - PS4 - 5)*
1,2,3,6,	**WHST.9-12. 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. (HS-PS1-3) ,(H S - PS1 -6) ,(HS-PS2-3),(HS-PS2-5),(HS-PS3-3),(HS-PS3-4),(HS-PS3-5)*
1,2,3,4,5,6,8,9, 11	**WHST.9-12. 9**	*Draw evidence from informational texts to support analysis, reflection, and research. (HS - PS1 - 3),(HS-PS2-1),(HS-PS2-5)*
8	**WHST.11-1 2.8**	*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*

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		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. *(HS-PS1-3),(HS-PS2-1),(HS-PS2-5),(HS-PS3-1),(HS-PS3-2),(HS-PS3-5),(HS-PS4-4)*
8	**SL.11-12.5**	*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.(HS-PS1-4),(HS-PS3-1),(HS-PS3-2),(HS-PS3-5)*

21st-Century Skills and Technology Integration (Standard 8)
List appropriate units below for which strands (A through F) will be addressed

Standard 8.1 (K-12)		**Educational Technology:** *All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.*
Unit Addressed	**Strand Letter**	**Standard Description**
1-11	**Strand A**	**Technology Operations and Concepts:** *Students demonstrate a sound understanding of technology concepts, systems, and operations.*
3	**Strand B**	**Creativity and Innovation:** *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*
1-11	**Strand C**	**Communication and Collaboration:** *Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.*
1-11	**Strand D**	**Digital Citizenship:** *Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.*
8	**Strand E**	**Research and Information Fluency:** *Students apply digital tools to gather, evaluate, and use information.*

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8	**Strand F**	**Critical thinking, problem-solving, and decision making:** *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*

Career Ready Practices (Standard 9)
List appropriate units below for which CRPs will be addressed

Unit Addressed	Standard #	Standard Description
1-11	**CRP1**	*Act as a responsible and contributing citizen and employee.*
1-11	**CRP2**	*Apply appropriate academic and technical skills.*
	CRP3	*Attend to personal health and financial well-being.*
1-11	**CRP4**	*Communicate clearly and effectively and with reason.*
8	**CRP5**	*Consider the environmental, social and economic impacts of decisions.*
2,8	**CRP6**	*Demonstrate creativity and innovation.*
2,8	**CRP7**	*Employ valid and reliable research strategies.*
1-11	**CRP8**	*Utilize critical thinking to make sense of problems and persevere in solving them.*
1-11	**CRP9**	*Model integrity, ethical leadership, and effective management.*
	CRP10	*Plan education and career paths aligned to personal goals.*
1-11	**CRP11**	*Use technology to enhance productivity.*
2,8	**CRP12**	*Work productively in teams while using cultural global competence*

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Interdisciplinary Connections
List any other content standards addressed as well as appropriate units

Visual & Performing Arts Integration (Standard 1)
List appropriate units below for which standards (1.1 through 1.4) may be addressed

Unit Addressed	Standard #	Standard Description
	Standard 1.1	**The Creative Process:** *All students will demonstrate an understanding of the elements and principles that govern the creation of works of art in dance, music, theatre, and/or visual art.*
	Standard 1.2	**History of the Arts and Culture:** *All students will understand the role, development, and influence of the arts throughout history and across cultures.*
2,8	**Standard 1.3**	**Performing/Presenting/Producing:** *All students will synthesize those skills, media, methods, and technologies appropriate to creating, performing, and/or presenting works of art in dance, music, theatre, and/or visual art.*
	Standard 1.4	**Aesthetic Responses & Critique Methodologies:** *All students will demonstrate and apply an understanding of arts philosophies, judgment, and analysis to works of art in dance, music, theatre, and/or visual art.*

Other Interdisciplinary Content Standards
List appropriate units below for any other content/standards that may be addressed

Unit Addressed	Content / Standard #	Standard Description….
7,8,11	*MP.2*	*Reason abstractly and quantitatively. (HS-PS1-5),(HS-PS1-7)*
1,2	*MP.4*	*Model with mathematics. (HS-PS2-1),(HS-PS2-2)*
1,2,3	*HSN-Q.A.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. (HS-PS1-2),(HS-PS1-3),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7),(HS-PS1-8)*
1,2	*HSN-Q.A.2*	*Define appropriate quantities for the purpose of descriptive modeling. (HS-PS1-4),(HS-PS1-7),(HS-PS1-8)*

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1,2,3	*HSN-Q.A.3*	*Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS1-2),(HS-PS1-3),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7),(HS-PS1-8)*

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Pacing Guide (All Dates are approximate based on the school calendar)

Unit/ Topic	Month (w/Approx number of Teaching Days)
Physics Fundamentals Linear Motion (1-D)	**September** **(~19 days)**
Forces	**October** **(~19 days)**
Work and Machines	**November** **(~16 days)**
Energy, Thermal Energy and Heat	**December** **(~15 days)**
Electricity (Static)	**January** **(~18 days)**
Electricity (Current and Circuits)	**February** **(~18 days)**
Magnetism and Electromagnetism	**March** **(~15-20 days)**
Waves	
Introduction to Matter	**April** **(~15-20 days)**
Solids, Liquids, and Gases	
Elements and the Periodic Table	**May** **(~18 days)**
Atoms and Bonding	
Chemical Reactions	**June** **(~15 days)**

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Units

Contact the Content Supervisor for unit details.

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