

Montclair Public Schools

# Science

## Curriculum Guide

Academic Grade 10

2013-2014

Approved by the Montclair Board of Education  
September 2011/Revised: September 2013

Montclair Public Schools  
CCSS Geophysical Academic Unit: Marshall A.b

Subject	Geophysical Science ACADEMIC	Grade	10	Unit #	1	Pacing	8-10 Weeks
Unit	Geochemistry						
<b>Overview</b>							
After a brief pre-assessment, students will review the basics of the scientific process as well as scientific notation and the metric system (from kilo- to milli-). This will follow with a review of MS material regarding matter, its properties, and its states, as well as mixtures/pure substances, chemical formulas, coefficients, and subscripts. Finally, students will investigate atomic structure and theory, periodic trends, chemical bonds and their link to minerals/crystal growth. Links to mineral uses as natural resources and human impacts as per ESS3-2 and ESS3-4 are investigated. Articles/readings should be Lexile level 960 – 1115.							
Standard #	NGSS	SLO #	Student Learning Objectives	Depth of Knowledge			
PS1-1	<ul style="list-style-type: none"> <li>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)</li> <li>Develop models to describe the atomic composition of simple molecules and extended structures (MS)</li> </ul>	1	Apply knowledge of atomic properties to predict ions and/or bonds formed between elements	3			
		2	Label periodic table trends, including energy levels, valence electrons, ion charges, families/groups	2			
ELA RST.9-10.7	<ul style="list-style-type: none"> <li>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.</li> </ul>	3	Create a table/chart illustrating an example of each group/family from the periodic table	4			
PS1-2	<ul style="list-style-type: none"> <li>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)</li> <li>Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred (MS)</li> </ul>	4	Investigate the link between compounds and minerals in terms of properties, chemical makeup, and strength of forces between particles	3			
		5	Compare types of physical and chemical changes and classify/predict outcomes of various combinations of substances	2			
ELA WHST.9-10.5	<ul style="list-style-type: none"> <li>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.</li> </ul>	6	Construct written laboratory reports for each laboratory exercise completed. Revise each new report based on feedback from previous reports	3			

Montclair Public Schools  
CCSS Geophysical Academic Unit: Marshall A.b

MS-PS1-4	<ul style="list-style-type: none"> <li>Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed</li> </ul>	7	Graph/draw representations of molecules in different states of matter, as well as the relationship between the change in state and the temperature/energy required	2
HS-PS1-3	<ul style="list-style-type: none"> <li>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</li> </ul>	8	Differentiate between molecules, formula units, crystal structures, and the different bond types in terms of particle interactions and forces	3
ELA WHST.9-10.7	<ul style="list-style-type: none"> <li>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.</li> </ul>	3	Create a table/chart illustrating an example of each group/family from the periodic table	4
ELA WHST.9-10.8	<ul style="list-style-type: none"> <li>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.</li> </ul>	3	Create a table/chart illustrating an example of each group/family from the periodic table	4
ELA WHST.9-10.9	<ul style="list-style-type: none"> <li>Draw evidence from informational texts to support analysis, reflection, and research.</li> </ul>	3	Create a table/chart illustrating an example of each group/family from the periodic table	4
HS-ESS3-2	<ul style="list-style-type: none"> <li>Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources</li> </ul>	9	Critique resource extraction techniques and support using evidence for reducing, reusing, and recycling resources rather than extracting new ones	4
HS-ESS3-4	<ul style="list-style-type: none"> <li>Evaluate or refine a technological solution that reduces impacts of human activities on natural systems</li> </ul>	10	Analyze methods of reducing human impacts of mineral extraction using evidence from various extraction techniques and their effects	4

Montclair Public Schools  
CCSS Geophysical Academic Unit: Marshall A.b

<b>Big Ideas: Marshall A.c</b>
<ol style="list-style-type: none"><li>1. The structure of matter affects periodic trends.</li><li>2. The arrangement and bonding of particles affects the properties of matter</li><li>3. Earth's resources are essential for human sustainability, though this has certain impacts on Earth's systems</li></ol>
<b>Essential Questions: Marshall A.c, C.c</b>
<ol style="list-style-type: none"><li>1. How can one explain the structure &amp; properties of matter?</li><li>2. How can particles combine to produce a substance with different properties?</li><li>3. How do humans depend on Earth's resources?</li></ol>
<b>Assessments: Marshall A.d, D.c</b>
Formal and informal formative and summative assessments as determined by the teacher Common Benchmark as per district schedule
<b>Key Vocabulary</b>
<ul style="list-style-type: none"><li>• Matter, Atom, Periodic Law, Chemical Structure, Crystal, Mineral, Resource</li></ul>
<b>Suggested Resources (These are recommended; you may select others as long as they are aligned to the standards and Lexile levels in this unit of study.)</b>
<ul style="list-style-type: none"><li>• Holt, Rinehart &amp; Winston (2001) <i>Science Spectrum: Physical Science with Earth &amp; Space Science</i>:<ul style="list-style-type: none"><li>○ Chapter 1 – Introduction to Science</li><li>○ Chapter 2 – Matter</li><li>○ Chapter 3 – Atoms &amp; The Periodic Table</li><li>○ Chapter 4.1, 4.1, 4.3 – The Structure of Matter</li><li>○ Chapter 17 – Planet Earth</li></ul></li></ul>
<ul style="list-style-type: none"><li>• <i>30 Days</i> Season 3, Episode 1: Working in a Coal Mine (video)</li><li>• <i>Dirty Jobs</i> Season 2, Episode 28: Coal Miner (video)</li></ul>
<ul style="list-style-type: none"><li>• CCSS Framework Appendix A: Grade Level Text Complexity (p.5)</li></ul>
<ul style="list-style-type: none"><li>• CCSS Framework Appendix B: Text Exemplars and Sample Performance Tasks</li></ul>
<ul style="list-style-type: none"><li>• CCSS Framework Appendix C: Writing Exemplars</li></ul>

Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

DIFFERENTIATION			
Special Education	ELL	Rtl	
<ul style="list-style-type: none"> <li>• Modifications &amp; accommodations as listed in the student's IEP</li> <li>• Assign a peer to help keep student on task</li> <li>• Modified or reduced assignments</li> <li>• Reduce length of assignment for different mode of delivery</li> <li>• Increase one to one time</li> <li>• Working contract between you and student at risk</li> <li>• Prioritize tasks</li> <li>• Think in concrete terms and provide hands on tasks</li> <li>• Position student near helping peer or have quick access to teacher</li> <li>• Anticipate where needs will be</li> <li>• Break tests down in smaller increments</li> <li>• NJDOE resources</li> </ul>	<ul style="list-style-type: none"> <li>• Strategy groups</li> <li>• Teacher conferences</li> <li>• Graphic organizers</li> <li>• Modification plan</li> <li>• NJDOE resources</li> <li>• Adapt a Strategy-Adjusting strategies for ESL students: <a href="http://www.teachersfirst.com/content/esl/adaptstratcfm">http://www.teachersfirst.com/content/esl/adaptstratcfm</a></li> </ul>	<ul style="list-style-type: none"> <li>• Tiered Interventions following Rtl framework</li> <li>• Rtl Intervention Bank</li> <li>• Foundations Double-Dose (Tier II)</li> <li>• LLI (Tier III)</li> <li>• FFI Skill Report: DRA On-Line</li> <li>• enVision intervention supports</li> <li>• NJDOEresources</li> </ul>	
ALIGNMENT TO 21 <sup>st</sup> CENTURY SKILLS AND TECHNOLOGY			
21 <sup>st</sup> Century/ Interdisciplinary Themes: Bold all that apply		21 <sup>st</sup> Century Skills: Bold all that apply	
<b>Global Awareness</b> Financial, Economic, Business and Entrepreneurial Literacy Civic Literacy Health Literacy <b>Environmental Literacy</b>		<b>Creativity &amp; Innovation</b> <b>Critical Thinking &amp; Problem Solving</b> <b>Communication &amp; Collaboration</b> <b>Media Literacy</b> <b>Information Literacy</b> <b>Information, Communication &amp; Technology</b> <b>Life &amp; Career Skills</b>	
Technology Infusion			
<ul style="list-style-type: none"> <li>• Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others</li> <li>• Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.</li> <li>• Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.</li> </ul> Epson Interactive Whiteboard Applications			
Evidence of Student Learning			
<ul style="list-style-type: none"> <li>• Common benchmark</li> <li>• Evaluation rubrics</li> </ul>	<ul style="list-style-type: none"> <li>• Teacher-student conferences</li> <li>• Running records</li> </ul>	<ul style="list-style-type: none"> <li>• Students' published work</li> <li>• Unit tests</li> </ul>	<ul style="list-style-type: none"> <li>• Quizzes</li> <li>• Laboratory Investigations</li> </ul>

Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

Subject	Geophysical Science ACADEMIC	Grade	10	Unit #	2	Pacing	Marking Period 2
Unit	Continental Dynamics						
<b>Overview</b>							
Students will investigate how minerals combine to form igneous rocks as the first rocks in Earth's history, how all three rock types cycle throughout the history of the Earth, how major catastrophic events as well as gradual changes over geologic time formed the Earth as we know it. Students will examine the composition of Earth's layers and the seismic evidence for this explanation, as well as how nuclear decay in the core causes convection cycles in the mantle, which drive plate tectonics and the creation and recycling of crustal material. History of and evidence for both Wegener's Continental Drift hypothesis and Hess's Theory of Seafloor Spreading are supported through evidence from fossil record, radiometric dating, and current geologic features. How the three types of plate boundaries cause movement of the lithospheric plates to cause various geologic features in different geographic locations.							
Standard #	NGSS	SLO #	Student Learning Objectives			Depth of Knowledge	
MS-ESS1-4	<ul style="list-style-type: none"> <li>Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6 billion-year-old history</li> </ul>	1	Interpret the geologic time scale to understand earth's 4.6 billion year history			3	
MS-ESS2-2	<ul style="list-style-type: none"> <li>Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales</li> </ul>	2	Compare & contrast major geologic events on both large and small scales, including sudden catastrophic events			2	
ESS2-1	<ul style="list-style-type: none"> <li><b>Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features (HS)</b></li> <li>Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process (MS)</li> </ul>	3	<b>Differentiate between plate boundaries and the geologic features they form</b>			<b>3</b>	
		4	Label a diagram of the rock cycle and the layers of the earth			2	
ESS2-3	<ul style="list-style-type: none"> <li><b>Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection (HS)</b></li> <li>Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions (MS)</li> </ul>	5	<b>Investigate the composition of earth's layers using seismic data and the connection to lithospheric plate movement</b>			<b>3</b>	
		6	Summarize Wegener's hypothesis of continental drift in terms of current geologic features & fossil record			2	
RST.9-10.1	<ul style="list-style-type: none"> <li><b>Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</b></li> </ul>	6	Summarize Wegener's hypothesis of continental drift in terms of current geologic features & fossil record			2	

Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

<b>HS-PS1-8</b>	<ul style="list-style-type: none"> <li>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</li> </ul>	7	Differentiate between alpha, beta, and gamma decay and their relationship to half-life and radiometric (absolute) dating. Connect this nuclear decay to the heat generated by the earth's core	$\frac{3}{4}$
<b>HS-ESS1-5</b>	<ul style="list-style-type: none"> <li>Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks</li> </ul>	8	Create a model of Hess's Theory of Seafloor Spreading	4
<b>RST.9-10.1</b>	<ul style="list-style-type: none"> <li>Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</li> </ul>	8	Evaluate Hess's Theory of Seafloor Spreading	3
<b>WHST.9-10.2</b>	<ul style="list-style-type: none"> <li>Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.</li> </ul>	8	Evaluate Hess's Theory of Seafloor Spreading	3
<b>HS-PS3-5</b>	<ul style="list-style-type: none"> <li>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 object due to the interaction</li> </ul>	8	Create a model of Hess's Theory of Seafloor Spreading	4
<b>ELA WHST.9-10.7</b>	<ul style="list-style-type: none"> <li>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.</li> </ul>	8	Evaluate Hess's Theory of Seafloor Spreading	3
<b>ELA WHST.9-10.8</b>	<ul style="list-style-type: none"> <li>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.</li> </ul>	8	Evaluate Hess's Theory of Seafloor Spreading	3

Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

<p><b>ELA WHST.9-10.9</b></p>	<ul style="list-style-type: none"> <li>• Draw evidence from informational texts to support analysis, reflection, and research.</li> </ul>	8	Evaluate Hess's Theory of Seafloor Spreading	3
<p><b>HS-PS2-1</b></p>	<ul style="list-style-type: none"> <li>• 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.</li> </ul>	9	Calculate the force with which tectonic plates collide and subduct, as well as their acceleration due to their mass. [Algebraically solve for each variable (honors only)]	3
<p><b>RST.9-10.1</b></p>	<ul style="list-style-type: none"> <li>• Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</li> </ul>	10	Investigate Newton's Second Law of Motion to provide support for the mathematical calculations in SLO #9	3
<p><b>ELA WHST.9-10.9</b></p>	<ul style="list-style-type: none"> <li>• Draw evidence from informational texts to support analysis, reflection, and research.</li> </ul>	10	Investigate Newton's Second Law of Motion to provide support for the mathematical calculations in SLO #9	3
<p><b>MS-PS4-1</b></p>	<ul style="list-style-type: none"> <li>• Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.</li> </ul>	11	Classify the strength of an earthquake based on the amplitude of the seismic waves at seismic stations of varying distance from the epicenter	2
<p><b>MS-ESS3-2</b></p>	<ul style="list-style-type: none"> <li>• Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects</li> </ul>	12	Analyze historical data of natural hazards to predict future catastrophic events.	3



Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

<b>Big Ideas</b>
<ul style="list-style-type: none"> <li>• Making inferences about events in Earth’s history based on a data record that is increasingly incomplete that farther you go back in time</li> <li>• A mathematical analysis of radiometric dating is used to comprehend how absolute ages are obtained for the geologic record</li> <li>• A key to Earth’s history is the coevolution of the biosphere with Earth’s other systems, not only in the ways that climate and environmental changes have shaped the course of evolution but also in how emerging life forms have been responsible for changing Earth</li> </ul>
<b>Essential Questions</b>
<ul style="list-style-type: none"> <li>• How do people reconstruct and date events in Earth’s planetary history?</li> <li>• Why do the continents move?</li> <li>• How does the movement of tectonic plates impact the surface of Earth?</li> </ul>
<b>Assessments</b>
<ul style="list-style-type: none"> <li>• Priority and focus SLOs are measured using chapter tests</li> <li>• Common Benchmark as per district schedule</li> <li>• Non-priority or focus SLOs are measured throughout the unit in a variety of ways (quizzes, exit tickets, check for understanding, journal entries, etc.)</li> </ul>
<b>Key Vocabulary</b>
<ul style="list-style-type: none"> <li>• rock cycle, seismic wave, convection, continental drift, sea-floor spreading, earthquake, fault, volcano, fossil, law of superposition, half-life</li> </ul>
<b>Suggested Resources</b>
<ul style="list-style-type: none"> <li>• Prentice Hall (2001) <i>Science Explorer: Earth Science</i>:             <ul style="list-style-type: none"> <li style="width: 50%;">○ Chapter 3 – Rocks</li> <li style="width: 50%;">○ Chapter 6 – Volcanoes</li> <li style="width: 50%;">○ Chapter 4 – Plate Tectonics</li> <li style="width: 50%;">○ Section 9.2 –Finding the Relative Age of Rocks</li> <li style="width: 50%;">○ Chapter 5 – Earthquakes</li> <li style="width: 50%;">○ Section 9.3 – Radioactive Dating</li> </ul> </li> </ul>
<p>Video Resources:</p> <ul style="list-style-type: none"> <li>• <i>Naked Science</i> Season, Episode : Angry Earth</li> <li>• <i>Naked Science</i> Season, Episode : Supervolcano</li> <li>• <i>How the Earth Was Made</i>, Episode: Hawai’i</li> <li>• <i>How the Earth Was Made</i>, Episode: New York</li> <li>• <i>Earth: The Biography</i>, Episode: Volcanoes</li> </ul>
<ul style="list-style-type: none"> <li>• CCSS Framework Appendix A: Grade Level Text Complexity (p.5)</li> <li>• CCSS Framework Appendix B: Text Exemplars and Sample Performance Tasks</li> <li>• CCSS Framework Appendix C: Writing Exemplars</li> </ul>

Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

DIFFERENTIATION			
Special Education	ELL	Rtl	
<ul style="list-style-type: none"> <li>• Modifications &amp; accommodations as listed in the student's IEP</li> <li>• Assign a peer to help keep student on task</li> <li>• Modified or reduced assignments</li> <li>• Reduce length of assignment for different mode of delivery</li> <li>• Increase one to one time</li> <li>• Working contract between you and student at risk</li> <li>• Prioritize tasks</li> <li>• Think in concrete terms and provide hands on tasks</li> <li>• Position student near helping peer or have quick access to teacher</li> <li>• Anticipate where needs will be</li> <li>• Break tests down in smaller increments</li> <li>• NJDOE resources</li> </ul>	<ul style="list-style-type: none"> <li>• Strategy groups</li> <li>• Teacher conferences</li> <li>• Graphic organizers</li> <li>• Modification plan</li> <li>• NJDOE resources</li> <li>• Adapt a Strategy-Adjusting strategies for ESL students: <a href="http://www.teachersfirst.com/content/esl/adaptstrat.cfm">http://www.teachersfirst.com/content/esl/adaptstrat.cfm</a></li> </ul>	<ul style="list-style-type: none"> <li>• Tiered Interventions following Rtl framework</li> <li>• Rtl Intervention Bank</li> <li>• Foundations Double-Dose (Tier II)</li> <li>• LLI (Tier III)</li> <li>• FFI Skill Report: DRA On-Line</li> <li>• enVision intervention supports</li> <li>• NJDOE resources</li> </ul>	
ALIGNMENT TO 21 <sup>ST</sup> CENTURY SKILLS AND TECHNOLOGY			
21 <sup>st</sup> Century/ Interdisciplinary Themes: Bold all that apply		21 <sup>st</sup> Century Skills: Bold all that apply	
<b>Global Awareness</b> Financial, Economic, Business and Entrepreneurial Literacy Civic Literacy Health Literacy <b>Environmental Literacy</b>		<b>Creativity &amp; Innovation</b> <b>Critical Thinking &amp; Problem Solving</b> <b>Communication &amp; Collaboration</b> <b>Media Literacy</b> <b>Information Literacy</b> <b>Information, Communication &amp; Technology</b> <b>Life &amp; Career Skills</b>	
Technology Infusion			
<ul style="list-style-type: none"> <li>• Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others</li> <li>• Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.</li> <li>• Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.</li> </ul> Epson Interactive Whiteboard Applications			
Evidence of Student Learning			
<ul style="list-style-type: none"> <li>• Common benchmark</li> <li>• Evaluation rubrics</li> </ul>	<ul style="list-style-type: none"> <li>• Teacher-student conferences</li> <li>• Running records</li> </ul>	<ul style="list-style-type: none"> <li>• Students' published work</li> <li>• Unit tests</li> </ul>	<ul style="list-style-type: none"> <li>• Quizzes</li> <li>• Laboratory Investigations</li> </ul>

Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

Subject	Geophysical Science Academic	Grade	10	Unit #	3	Pacing	Marking Period 3
Unit	Geomorphology & Climate						
<b>Overview</b>							
Students will investigate how rocks and earth formations are broken down by weathering and erosion to produce sediments, modeling the processes of glacial, wind, and running water erosion. Then students will investigate where the water comes from (water cycle) in order to weather and erode rock formations, and how the unequal heating of the earth results in wind and ocean patterns that affect global climate (feedback systems). Finally, students will investigate climate models and weather patterns to differentiate between weather and climate, and the patterns of both natural and anthropogenic climate change over time.							
Standard #	NGSS	SLO #	Student Learning Objectives	Depth of Knowledge			
<b>ESS2-1</b>	<ul style="list-style-type: none"> <li>Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features</li> </ul>	1	Investigate the origin of geological features as being either a result of constructive forces or destructive forces.	3			
		2	Classify these geological features as they result from various types of stress	2			
ESS3-2	<ul style="list-style-type: none"> <li>Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects</li> </ul>	3	Analyze historical data of natural hazards to predict future catastrophic events.	3			
ESS2-2	<ul style="list-style-type: none"> <li>Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems</li> </ul>	4	Analyze global climate data to investigate the effect of Polar ice melt and greenhouse gases on other Earth systems.	4			
ESS2-5	<ul style="list-style-type: none"> <li>Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes</li> <li>Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions</li> </ul>	5	Investigate the mechanical weathering of Earth materials to create connections between the hydrologic cycle and the rock cycle.	3/4			
		6	Predict how acid rain will affect Earth materials through chemical weathering and recrystallization.	2			
		7	Analyze a weather forecast using knowledge of air mass interactions to predict resulting weather conditions.	2/4			

Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

<b>ESS2-4</b>	<ul style="list-style-type: none"> <li>Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate (HS)</li> <li>Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity (MS)</li> </ul>	8	Analyze climate data over various timescales (1-10yr; 10-100yr; 10K-100K yr, etc) to compare the cause and effect of climate change (surface temperature, precipitation patterns, global ice volumes, and sea levels).	4
		9	Explain how energy transfer in a water molecule creates a change of state, which drives our water cycle.	2
<b>ESS3-5</b>	<ul style="list-style-type: none"> <li>Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of regional climate change and associated future impacts to Earth systems</li> </ul>	10	Analyze climate data to predict the outcome of future climate change as a result of similar processes. (i.e. how global ice melt causes sea levels to rise, which, in turn, results in coastal flooding)	3/4
<b>ELA WHST.9-10.9</b>	<ul style="list-style-type: none"> <li>Draw evidence from informational texts to support analysis, reflection, and research.</li> </ul>			
<b>RST.9-10.1</b>	<ul style="list-style-type: none"> <li>Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</li> </ul>			
<b>Big Ideas</b>				
<ul style="list-style-type: none"> <li>Sun-driven surface systems tear down the land through weathering and erosion.</li> <li>Role water plays in affecting weather.</li> <li>Examine the ways that human activities cause feedbacks that create changes to other systems</li> </ul>				
<b>Essential Questions</b>				
<ul style="list-style-type: none"> <li>How do the major earth systems interact?</li> <li>How the properties and movements of water shape earth's surface and affect its systems?</li> <li>What regulates weather and climate?</li> </ul>				
<b>Assessments</b>				
<ul style="list-style-type: none"> <li>Priority and focus SLOs are measured using chapter tests and teacher based assessment</li> <li>Non-priority or focus SLOs are measured throughout the unit in a variety of ways (quizzes, exit tickets, check for understanding, journal entries, etc.)</li> <li>Common Benchmark as per district schedule</li> </ul>				
<b>Key Vocabulary</b>				
<ul style="list-style-type: none"> <li>Stress, Deformation, Weathering, Erosion, Hydrologic Cycle, Climate, Weather, Anthropogenic</li> </ul>				
<b>Suggested Resources</b>				
<ul style="list-style-type: none"> <li>Prentice Hall (2001) <i>Science Explorer: Earth Science</i>:             <ul style="list-style-type: none"> <li>Chapter 7, Section 1: Rocks and Weathering</li> <li>Chapter 16: Weather Factors</li> </ul> </li> </ul>				

Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

- Chapter 8: Erosion and Deposition
- Chapter 15: The Atmosphere

- Chapter 17: Weather Patterns
- Chapter 18: Climate and Climate Change

Video Resources:

- *How the Earth Was Made*, Episode: Hawai'i
- *Earth: The Biography*

Web Resources:

- Virtual River activity: <http://sciencecourseware.com/VirtualRiver/>
- CCSS Framework Appendix A: Grade Level Text Complexity (p.5)
- CCSS Framework Appendix B: Text Exemplars and Sample Performance Tasks
- CCSS Framework Appendix C: Writing Exemplars

**DIFFERENTIATION**

<b>Special Education</b>	<b>ELL</b>	<b>Rtl</b>
<ul style="list-style-type: none"> <li>● Modifications &amp; accommodations as listed in the student's IEP</li> <li>● Assign a peer to help keep student on task</li> <li>● Modified or reduced assignments</li> <li>● Reduce length of assignment for different mode of delivery</li> <li>● Increase one to one time</li> <li>● Working contract between you and student at risk</li> <li>● Prioritize tasks</li> <li>● Think in concrete terms and provide hands on tasks</li> <li>● Position student near helping peer or have quick access to teacher</li> <li>● Anticipate where needs will be</li> <li>● Break tests down in smaller increments</li> <li>● NJDOE resources</li> </ul>	<ul style="list-style-type: none"> <li>● Strategy groups</li> <li>● Teacher conferences</li> <li>● Graphic organizers</li> <li>● Modification plan</li> <li>● NJDOE resources</li> <li>● Adapt a Strategy-Adjusting strategies for ESL students: <a href="http://www.teachersfirst.com/content/esl/adaptstrat.cfm">http://www.teachersfirst.com/content/esl/adaptstrat.cfm</a></li> </ul>	<ul style="list-style-type: none"> <li>● Tiered Interventions following Rtl framework</li> <li>● Rtl Intervention Bank</li> <li>● Foundations Double-Dose (Tier II)</li> <li>● LLI (Tier III)</li> <li>● FFI Skill Report: DRA On-Line</li> <li>● enVision intervention supports</li> <li>● NJDOE resources</li> </ul>

Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

**ALIGNMENT TO 21<sup>ST</sup> CENTURY SKILLS AND TECHNOLOGY**

<b>21<sup>st</sup> Century/ Interdisciplinary Themes: Bold all that apply</b>		<b>21<sup>st</sup> Century Skills: Bold all that apply</b>	
<b>Global Awareness</b> Financial, Economic, Business and Entrepreneurial Literacy Civic Literacy Health Literacy <b>Environmental Literacy</b>		<b>Creativity &amp; Innovation</b> <b>Critical Thinking &amp; Problem Solving</b> <b>Communication &amp; Collaboration</b> <b>Media Literacy</b> <b>Information Literacy</b> <b>Information, Communication &amp; Technology</b> <b>Life &amp; Career Skills</b>	
<b>Technology Infusion</b>			
<ul style="list-style-type: none"> <li>• Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others</li> <li>• Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.</li> <li>• Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.</li> </ul> Epson Interactive Whiteboard Applications			
<b>Evidence of Student Learning</b>			
<ul style="list-style-type: none"> <li>• Common benchmark</li> <li>• Evaluation rubrics</li> </ul>	<ul style="list-style-type: none"> <li>• Teacher-student conferences</li> <li>• Running records</li> </ul>	<ul style="list-style-type: none"> <li>• Students' published work</li> <li>• Unit tests</li> </ul>	<ul style="list-style-type: none"> <li>• Quizzes</li> <li>• Laboratory Investigations</li> </ul>

Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

<b>Subject</b>	Geophysical Science Academic	<b>Grade</b>	10	<b>Unit #</b>	4	<b>Pacing</b>	Marking Period 4
<b>Unit</b>	Astrophysics						
<b>Overview</b>							
Students will investigate the formation of the Universe, and classify its components based on size and type. Students will then begin to investigate the different units of the universe, such as the Earth-Sun-Moon relationships as well as the life cycle of a star, and draw conclusions based on nuclear fusion that only elements as heavy as iron form in stars, and heavier elements originated from supernovas. Modeling of the E-S-M relationships as well as the eccentricity of orbits will be explored. Finally, students will study electromagnetic radiation, its effects on humans, and how these waves behave (wavelength, frequency, energy) to produce different types of energy, colors of light, etc.							
<b>Standard</b>	<b>NGSS</b>	<b>SLO</b>	<b>Student Learning Objectives</b>			<b>Depth of Knowledge</b>	
<b>ESS1-1</b>	<b>Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches earth in the form of radiation</b>	1	<b>Formulate the life cycles of small, medium, and large stars, from their "birth" of fusion to their predicted future stages.</b>			3	
		2	<b>Investigate how scientists are able to predict the future stages of stars using data from telescopes and other stars (honors only)</b>			3	
		3	<b>Design a model to illustrate the lunar month, including points where Solar and Lunar eclipses will occur.</b>			4	
		4	<b>Investigate why the lunar month is not the same length as the sidereal month (honors only)</b>			3	
<b>ESS1-2</b>	<b>Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe</b>	5	<b>Analyze astronomical data (red shift spectra, cosmic background radiation, and stellar composition) to create an understanding of the Big Bang Theory and Universal expansion.</b>			4	
<b>ESS1-3</b>	<b>Communicate scientific ideas about the way stars, over their life cycle, produce elements</b>	6	<b>Explain the process of nucleosynthesis in a star's life cycle to understand its effect on a star's mass and stage of its lifespan.</b>			3	
		7	<b>Analyze and interpret data to determine scale properties of objects in the solar system</b>			2	
<b>ESS1-4</b>	<b>Use mathematical or computational representations to predict the motion of orbiting objects in the solar system</b>	8	<b>Support the motion of orbiting objects in the solar system through the analysis of Newtonian gravitation and Kepler's Laws.</b>			4	
<b>ESS1-6</b>	<b>Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history</b>	9	<b>Formulate a timeline of events from the formation of the Solar System to the formation of Earth, using data from meteorites, moon rocks, and Mars' surface.</b>			3	

Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media	10	Activate prior knowledge of algebra to calculate the frequency, wavelength, and speed of various waves to illustrate the relationships between these values.	3
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	11	Analyze the evidence behind electromagnetic radiation to support the theory that light can behave as a wave or a particle.	3
PS4-4	Evaluate the validity of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.	12	Interpret data in scientific journals/magazines to explain how the different frequencies of electromagnetic radiation can cause damage to living tissue when absorbed.	2
PS4-2	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials	13	Illustrate how light waves and mechanical waves are altered when they interact with various materials.	2
<b>ELA WHST 9-10.9</b>	<b>Draw evidence from informational texts to support analysis, reflection, and research.</b>			
<b>RST.9-10.1</b>	<b>Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</b>			
<b>Big Ideas</b>				
<ul style="list-style-type: none"> <li>Examine the processes governing the formation, evolution, and workings of the solar system and universe</li> <li>Analyze the data that support the theories of the formation of the solar system and universe</li> </ul>				
<b>Essential Questions</b>				
<ul style="list-style-type: none"> <li>How did the matter of our world form during the Big Bang and within the cores of stars?</li> <li>How do short-term changes in the behavior of our sun directly affect humans?</li> </ul>				
<b>Assessments</b>				
<ul style="list-style-type: none"> <li>Priority and focus SLOs are measured using chapter tests and the unit assessment</li> <li>Common Benchmark as per district schedule</li> <li>Non-priority or focus SLOs are measured throughout the unit in a variety of ways (quizzes, exit tickets, check for understanding, journal entries, etc.)</li> </ul>				
<b>Key Vocabulary</b>				
<ul style="list-style-type: none"> <li>Big Bang, electromagnetic radiation, spectrum, light year, star, planet, moon, galaxy, universe, rotation, revolution, orbit, solstice, equinox, eclipse, geosynchronous, fusion, transverse wave, longitudinal wave, wavelength, period, frequency</li> </ul>				
<b>Suggested Resources</b>				
<ul style="list-style-type: none"> <li>Prentice Hall (2001) <i>Science Explorer: Earth Science:</i> <ul style="list-style-type: none"> <li>Chapter 21: Stars, Galaxies, and the Universe</li> <li>Chapter 20, Section 2: The Sun</li> <li>Chapter 19: Earth, Moon, and Sun</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>Holt, Rinehart &amp; Winston (2008) <i>Science Spectrum: Physical Science with Earth &amp; Space Science:</i> <ul style="list-style-type: none"> <li>Chapter 15: Waves</li> <li>Chapter 16, Section 2: The Nature of Light</li> <li>Chapter 16, Section 3: Reflection and Color</li> </ul> </li> </ul>		
Video Resources:				



Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

<ul style="list-style-type: none"> <li>• <i>The Universe</i> (series)</li> <li>• <i>Through the Wormhole</i> (series)</li> <li>• <i>Naked Science</i> (series)</li> </ul>		
<ul style="list-style-type: none"> <li>• CCSS Framework Appendices A - C: Grade Level Text Complexity (p.5) ; Text Exemplars and Sample Performance Tasks; Writing Exemplars</li> </ul>		
DIFFERENTIATION		
Special Education	ELL	Rtl
<ul style="list-style-type: none"> <li>• Modifications &amp; accommodations as listed in the student's IEP</li> <li>• Assign a peer to help keep student on task</li> <li>• Modified or reduced assignments</li> <li>• Reduce length of assignment for different mode of delivery</li> <li>• Increase one to one time</li> <li>• Working contract between you and student at risk</li> <li>• Prioritize tasks</li> <li>• Think in concrete terms and provide hands on tasks</li> <li>• Position student near helping peer or have quick access to teacher</li> <li>• Anticipate where needs will be</li> <li>• Break tests down in smaller increments</li> <li>• NJDOE resources</li> </ul>	<ul style="list-style-type: none"> <li>• Strategy groups</li> <li>• Teacher conferences</li> <li>• Graphic organizers</li> <li>• Modification plan</li> <li>• NJDOE resources</li> <li>• Adapt a Strategy-Adjusting strategies for ESL students: <a href="http://www.teachersfirst.com/content/esl/adaptstrat.cfm">http://www.teachersfirst.com/content/esl/adaptstrat.cfm</a></li> </ul>	<ul style="list-style-type: none"> <li>• Tiered Interventions following Rtl framework</li> <li>• Rtl Intervention Bank</li> <li>• Foundations Double-Dose (Tier II)</li> <li>• LLI (Tier III)</li> <li>• FFI Skill Report: DRA On-Line</li> <li>• enVision intervention supports</li> <li>• NJDOE resources</li> </ul>
ALIGNMENT TO 21 <sup>st</sup> CENTURY SKILLS AND TECHNOLOGY		
21 <sup>st</sup> Century/ Interdisciplinary Themes: Bold all that apply	21 <sup>st</sup> Century Skills: Bold all that apply	
<b>Global Awareness</b> Financial, Economic, Business and Entrepreneurial Literacy Civic Literacy Health Literacy <b>Environmental Literacy</b>	<b>Creativity &amp; Innovation</b> <b>Critical Thinking &amp; Problem Solving</b> <b>Communication &amp; Collaboration</b> <b>Media Literacy</b> <b>Information Literacy</b> <b>Information, Communication &amp; Technology</b> <b>Life &amp; Career Skills</b>	
Technology Infusion		
<ul style="list-style-type: none"> <li>• Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others</li> <li>• Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.</li> <li>• Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.</li> </ul>		

Montclair Public Schools  
CCSS Geophysical Science Academic Unit: Marshall A.b

Epson Interactive Whiteboard Applications

**Evidence of Student Learning**

<ul style="list-style-type: none"><li>• Common benchmark</li><li>• Evaluation rubrics</li></ul>	<ul style="list-style-type: none"><li>• Teacher-student conferences</li><li>• Running records</li></ul>	<ul style="list-style-type: none"><li>• Students' published work</li><li>• Unit tests</li></ul>	<ul style="list-style-type: none"><li>• Quizzes</li><li>• Laboratory Investigations</li></ul>
---	---	---	---