TOWNSHIP OF UNION PUBLIC SCHOOLS

7th Grade Honors Science

Curriculum Guide

2014

Curriculum Guide Approved

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Science

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Mission Statement

The Township of Union Board of Education believes that every child is entitled to an education designed to meet his or her individual needs in an environment that is conducive to learning. State standards, federal and state mandates, and local goals and objectives, along with community input, must be reviewed and evaluated on a regular basis to ensure that an atmosphere of learning is both encouraged and implemented. Furthermore, any disruption to or interference with a healthy and safe educational environment must be addressed, corrected, or when necessary, removed in order for the district to maintain the appropriate educational setting.

Philosophy Statement

The Township of Union Public School District, as a societal agency, reflects democratic ideals and concepts through its educational practices. It is the belief of the Board of Education that a primary function of the Township of Union Public School System is to formulate a learning climate conducive to the needs of all students in general, providing therein for individual differences. The school operates as a partner with the home and community.

Statement of District Goals

- Develop reading, writing, speaking, listening, and mathematical skills.
- Develop a pride in work and a feeling of self-worth, self-reliance, and self discipline.
- Acquire and use the skills and habits involved in critical and constructive thinking.
- Develop a code of behavior based on moral and ethical principals.
- Work with others cooperatively.
- Acquire a knowledge and appreciation of the historical record of human achievement and failures and current societal issues.
- Acquire a knowledge and understanding of the physical and biological sciences.
- Participate effectively and efficiently in economic life and the development of skills to enter a specific field of work.
- Appreciate and understand literature, art, music, and other cultural activities.
- Develop an understanding of the historical and cultural heritage.
- Develop a concern for the proper use and/or preservation of natural resources.
- Develop basic skills in sports and other forms of recreation.

Course Description

The seventh grade Honors Science Curriculum is a continuum of the sixth grade course. Honor students will be expected to cover an extension and enrichment of the general seventh grade science concepts at a more in depth and accelerated pace. Students will also work more independently on projects and labs. All seventh grade honors students will be required to complete at home research projects. The coursework is rigorous and incorporates high-level analytical reasoning, creative thinking and problem solving strategies. Emphasis is placed on deep understanding of important concepts and the development of essential skills. Students are encouraged to approach learning in a variety of ways in order to develop a strong foundation for academic and intellectual growth, achievement, and personal success. They are encouraged to self-assess and reflect on their learning and the learning process.

Honors students are expected to meet or exceed high academic standards. Rigor is a critical component of academic excellence and is central to preparing students in middle school to succeed in advanced coursework in high school and in the global community.

The seventh grade elaborates upon and deepens the concepts of the spiral of physical, life, and earth science. This "spiral of knowledge" engenders the continuity of connections between and among the sciences aforementioned.

The physical science strands focus upon the characterization of matter and energy in a variety of ways. This leads to the life science concepts-how organisms use matter and energy to perform life functions and reproduce. The earth science strand is the obvious segue. Life on Earth is dependent upon the land, the atmosphere, the position of our planet in the solar system and the weather. Our final unit ties up the pieces in a tight package. The biogeochemical cycles encompasses the knowledge learned in all of the proficiencies.

The seventh grade science curriculum is just a link in the chain of knowledge that will allow our students to be empowered, life time learners.

Recommended Textbooks

McGraw-Hill Integrated iScience

Course Proficiencies

Physical Science

Students will be able to...

- Describe the parts of the atom, and explain how atoms of different elements differ.
- Classify matter based on both physical and chemical properties.
- Demonstrate that all substances undergo physical or chemical changes, which involve energy, to form new substances.
- Explain the Law of Conservation of Mass as it applies to these changes.
- Understand the characteristics and interactions (transfers and transformations) of various types of energy (potential, chemical, nuclear, kinetic, electric, mechanical, and thermal), as well as explain the Law of Conservation of Energy
- Describe how different types of forces affect objects (gravity, inertia, friction), as well as explain and describe motion (acceleration, speed, velocity)
- Analyze graphs that explain the motion of objects (Displacement-Time and Speed -Time)

Life Science

Students will be able to...

- Understand living things are composed of cells that carry out the functions required for life
- Understand that all animals and most plants depend on both other organisms and their environment to meet their needs
- Understand that organisms reproduce, develop, and have predictable life cycles, and that organisms contain genetic information that influences their traits and they pass this on to their offspring during reproduction (codominance, sex-linked traits, human genetic disorders). Explain the advantages and disadvantages of both sexual and asexual reproduction

Earth Science

Students will be able to...

- Describe and explain the cause of observable, predictable patterns of movement in the Sun-Earth-Moon system, which occur because of gravitational interaction and energy from the Sun.
- Understand that Earth's components form systems (the atmosphere, the geosphere, the biosphere, the hydrosphere), and that these systems continually interact (through the rock cycle, the water cycle, the carbon cycle, and the phosphorus cycle).
- Explain how different fossils form, and are dated, as well as understand how the geological time scale splits Earth's history into eons
- Through the study of plate tectonics, earthquakes, and volcanoes; explain that energy flow and movement of material from the Earth's interior causes geological events on the Earth's surface
- Describe the properties of air. Name and describe the layers of the atmosphere, explain how energy is transferred within the atmosphere, and the importance of the atmosphere to life on Earth. Explain the cause of both local and global winds.

Curriculum Units

Unit 1: Matter
Unit 2: Energy
Unit 3: Organization and Development of Living Things
Unit 4: Symbiotic Interactions
Unit 5: Heredity and Reproduction
Unit 6: Objects in the Universe
Unit 7: History of the Earth
Unit 8: Properties of Earth's Materials
Unit 9: Tectonics
Unit 10: Energy in Earth Systems
Unit 11: Weather and Climate
Unit 12: Biogeochemical Cycles

Pacing Guide- Course

Content	Number of Days
Unit 1: Matter	20
Unit 2: Energy	20
Unit 3: Organization and Development of Living Things	15
Unit 4: Symbiotic Interactions	5
Unit 5: Heredity and Reproduction	20
Unit 6: Objects in the Universe	20
Unit 7: History of the Earth	15
Unit 8: Properties of Earth's Materials	10
Unit 9: Tectonics	20
Unit 10: Energy in Earth Systems	5
Unit 11: Weather and Climate	15
Unit 12: Biogeochemical Cycles	5

Unit 1 Standard 5.1 Science Practices: **Science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.**

Strand A. Understand Scientific Explanations*: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.*

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How do we build and refine models that describe and explain the natural and designed world?	**Content** Core scientific concepts and principles represent the conceptual basis for model-building and facilitate the generation of new and productive questions. **CPI** **5.1.8.A.1** Demonstrate understanding and use interrelationships among central scientific concepts to revise explanations and to consider alternative explanations.	• Learn fundamental concepts, principles, theories, and models. • Then, build organized and meaningful conceptual structures that incorporate these concepts, principles and theories. • Then, use these relationships to revise claims and to discuss alternative explanations. **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 87-108 Making Thinking Visible: Talk and Argument	• Formal Lab Report • Daily challenges • Formatives quizzes (dipsticks) • Exit cards • Exit Dipstick Quizzes • Student driven presentations • Analysis questions • Conclusions • Analytically designed posters with Science Literacy • Summative tests • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines.

		Taking Science to School • pp. 36-45 Goals for Science Education • pp. 93-129 Knowledge and Understanding of the Natural World	• Projects or performance tasks –such as oral presentations, debates, performances, displays, or publications –that demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application See CAD for specific sample Assessment NJDOE http://www.state.nj.us/education/educators

	Content Results of observation and measurement can be used to build conceptual-based models and to search for core explanations **CPI** **5.1.8.A.2** Use mathematical, physical, and computational tools to build conceptual-based models and to pose theories.	• Use mathematical, physical, and computational tools to observe, measure, and explain natural phenomena. • Develop evidence-based models to explain the relationships between fundamental concepts and principles. • Construct and refine models and propose revised theories as new evidence becomes available **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 109-119 Making Thinking Visible: Modeling and Representation	
	Content Predictions and explanations are revised based on	• Evaluate the strengths of arguments based on the	

	systematic observations, accurate measurements, and structured data/evidence. **CPI** **5.1.8.A.3** Use scientific principles and models to frame and synthesize scientific arguments and pose theories	evidence presented. • Critique scientific arguments by considering the quality of the experimental design and data. **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 109-119 Making Thinking Visible: Modeling and Representation *Taking Science to School* • pp. 36-45 Goals for Science Education • pp. 93- 129 Knowledge and Understanding of the Natural World	

Strand B. Generate Scientific Evidence Through Active Investigations: *Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.*

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
What constitutes useful scientific evidence?	**Content** Evidence is generated and evaluated as part of building and refining models and explanations. **CPI** **5.1.8.B.1** Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.	• Ask scientific questions and determine what data to collect or measure in order to answer the questions. • Develop strategies for accurately measuring and collecting data. • Organize the data logically so that it may be used to answer questions or validate predictions. **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 109-119 Making Thinking Visible: Modeling and Representation *Taking Science to School* • pp. 36-45 Goals for	• Formal Lab Report • Daily challenges • Formatives quizzes (dipsticks) • Exit cards • Exit Dipstick Quizzes • Student driven presentations • Analysis questions • Conclusions • Analytically designed posters with Science Literacy • Summative tests • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks –such as oral presentations, debates,

	Content Mathematics and technology are used to gather, analyze, and communicate results. **CPI** **5.1.8.B.2** Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.	Science Education • pp. 129–160 Generating and Evaluating Scientific Evidence and Explanations • Use scientific tools with accuracy and confidence. • Use mathematics in the collection, organization and analysis of data. • Use tools of data analysis to organize and represent data. **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 127-148 Learning From Science Investigations *Taking Science to School* • pp. 36-45 Goals for Science Education • pp. 129–160 Generating and Evaluating Scientific Evidence and Explanations	performances, displays, or publications –that demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application See CAD for specific sample Assessment NJDOE http://www.state.nj.us/education/educators

	Content Carefully collected evidence is used to construct and defend arguments. **CPI** **5.1.8.B.4** Use quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.	• Evaluate the quality of the available data. • Justify claims with connections to other fundamental concepts and principles. • Use evidence and data to support both a claim and the reasoning behind a scientific argument. **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 109-119 Making Thinking Visible: Modeling and Representation *Taking Science to School* • pp. 36-45 Goals for Science Education • pp. 129–160 Generating and Evaluating Scientific Evidence and Explanations	

Strand C. Reflect on Scientific Knowledge: *Scientific knowledge builds on itself over time.*

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How is scientific knowledge constructed?	**Content** Scientific models and understandings of fundamental concepts and principles are refined as new evidence is considered. **CPI** **5.1.8.C.1** Monitor one's own thinking as understandings of scientific concepts are refined.	• Monitor and reflect on their ideas as those ideas change over time. • Extend investigations beyond inquiry and practice modeling, organizing observations, and historical reconstructions. • Search for core explanations and connections between fundamental concepts and principles as they develop their understandings. **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 109-119 Making Thinking Visible: Modeling and Representation	• Formal Lab Report • Daily challenges • Formatives quizzes (dipsticks) • Exit cards • Exit Dipstick Quizzes • Student driven presentations • Analysis questions • Conclusions • Analytically designed posters with Science Literacy • Summative tests • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks –such as oral presentations, debates, performances, displays, or

	Content Predictions and explanations are revised to account more completely for available evidence. **CPI** **5.1.8.C.2** Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models.	*Taking Science to School* • pp. 36-45 Goals for Science Education • pp. 168-182 Understanding How Scientific Knowledge is Constructed • Engage in evidence-based arguments as they explore and refine predictions or explanations. • Explore the reasoning for multiple interpretations for the same phenomenon. • Justify, citing evidence and reasoning, the revision of explanations or predictions. **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 109-119 Making Thinking Visible: Modeling and Representation	publications –that demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application See CAD for specific sample Assessment NJDOE http://www.state.nj.us/education/educators

	Content Science is a practice in which an established body of knowledge is continually revised, refined, and extended. **CPI** **5.1.8.C.3** Generate new and productive questions to evaluate and refine core explanations.	*Taking Science to School* • pp. 36-45 Goals for Science Education • pp. 168–182 Understanding How Scientific Knowledge is Constructed • Collaborate with peers to generate new questions and investigations to explore cause-and-effect relationships. • Create multiple representations of the results of an investigation. • Move confidently between multiple forms of representations (e.g., graph, chart, data table). **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 109-119 Making Thinking Visible: Modeling and Representation	

		Taking Science to School • pp. 36-45 Goals for Science Education • pp. 168–182 Understanding How Scientific Knowledge is Constructed	

Strand D. Participate Productively in Science: *The growth of scientific knowledge involves critique and communication, which are social practices that are governed by a core set of values and norms.*

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How does scientific knowledge benefit, deepen, and broaden from scientists sharing and debating ideas and information with peers?	**Content** Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work. **CPI** **5.1.8.D.1** Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.	• Engage in productive conversations with their peers. • Use partner talk, whole-group discussions, and small group work in order to learn from other other's ideas- through STEAM activities • Engage in multiple modes of communication such as speech, print, and electronic. **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 109-119 Making Thinking Visible: Modeling and Representation *Taking Science to School* • pp. 36-45 Goals for Science Education • pp. 186–203 Participation in	• Formal Lab Report • Daily challenges • Formatives quizzes (dipsticks) • Exit cards • Exit Dipstick Quizzes • Student driven presentations • Analysis questions • Conclusions • Analytically designed posters with Science Literacy • Summative tests • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks –such as oral

	Content In order to determine which arguments and explanations are most persuasive, communities of learners work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories (e.g., argumentation, representation, visualization, etc.). **CPI** **5.1.8.D.2** Engage in productive scientific discussion practices during conversations with peers, both face-to-face and virtually, in the context of scientific investigations and model-building.	Scientific Practices and Discourse • Pose, refine, and evaluate questions, investigations, models, and theories collaboratively (e.g., argumentation, representation, visualization, etc.). • Engage in evidence-based scientific arguments. • Persuade peers of the validity of one's own ideas and the ideas of others. **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 109-119 Making Thinking Visible: Modeling and Representation *Taking Science to School* • pp. 36-45 Goals for Science Education • pp. 186–203 Participation in Scientific Practices and	presentations, debates, performances, displays, or publications –that demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application See CAD for specific sample Assessment NJDOE http://www.state.nj.us/education/educators

	Content Instruments of measurement can be used to safely gather accurate information for making scientific comparisons of objects and events. **CPI** **5.1.8.D.3** Demonstrate how to safely use tools, instruments, and supplies.	Discourse • Demonstrate understanding of safe and accurate measurement in the context of an investigation. • Take proactive measures to insure their personal safety and the safety of their peers. • Demonstrate an individual sense of responsibility and good habits for safety. **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 109-119 Making Thinking Visible: Modeling and Representation *Taking Science to School* • pp. 36-45 Goals for Science Education • pp. 186–203 Participation in Scientific Practices and Discourse	

	Content Organisms are treated humanely, responsibly, and ethically. **CPI** **5.1.8.D.4** Handle and treat organisms humanely, responsibly, and ethically.	• Investigate potential health hazards such as E Coli, dander, or other allergens prior to bringing them into the classroom. • Demonstrate knowledge about the care of organisms so that both students and specimens stay safe and healthy during all activities. • Follow local, state, and national laws, policies, and regulations when live organisms are included in classroom activities. • Engage in research and discussions about the ethical questions regarding the use of organisms in instruction. **Resources** *Ready, Set, Science!* • pp. 17-36 Four Strands of Scientific Learning • pp. 109-119 Making Thinking Visible: Modeling and Representation *Science Curriculum Study* • p. 179 Academically Productive Talk • pp. 186–203 Participation in Scientific Practices and Discourse *Science Class*, NSTA, 2003 accessed at: http://science.nsta.org/enewsletter/2003-06/member_elementary.htm	

Standard 5.2 Physical Science: Physical science principles, including fundamental ideas about matter, energy and motion, are powerful conceptual tools for making sense of phenomena in physical, living and Earth systems science.

Strand A Properties of Matter: All objects and substances in the natural world are composed of matter. Matter has two fundamental properties: matter takes up space and matter has inertia.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How can we explain how materials react when we do things to them?	**Content** All matter is made of atoms. Matter made of only one type of atom is called an element. **CPI** **5.2.8.A.1** – Explain that all matter is made of atoms, and give examples of common elements **Content** All substances are composed of one or more of approximately 100 elements. **CPI** **5.2.8.A.2** – Analyze and explain the implications of the statement "all	• Predict the elements that will result from electrolysis of water based on the molecular formula for water and revise claims as appropriate based on the evidence derived. • Collaborate with peers to develop strategies for describing the types of atoms and their numbers in an element or compound. • Collaborate with peers to develop techniques for determining the elements that make common things (e.g., sugar (C6H12O6),	• Summative Test • Conclusion • Lab Report • Performance Assessment • Quiz • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks –such as oral presentations, debates, performances, displays, or publications –that demonstrate application of

	substances are composed of elements" **Content** Acids are a class of compounds that exhibit common chemical properties, including a sour taste, characteristic color changes with litmus and other acid/base indicators, and the tendency to react with bases to produce a salt and water. **CPI** **5.2.8.A.7** – Determine the relative acidity and reactivity of common acids, such as vinegar or cream of tartar, through a variety of student-designed activities	salt (NaCl), water (H2O), etc). • Investigate the properties of common acids and bases used in cooking (e.g., vinegar, baking soda, and cream of tartar). • Determine the relative strength of the acids and bases and then explain how those properties determine their inclusion in a recipe. • Diagram – Illustrate & Analyze: Students will draw and analyze atomic diagrams • Lab Activity: Students will complete a lab about acids and bases, comparing their characteristics • Stations: Students will complete a station activity comparing and contrasting	learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application ***Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

		mixtures and compounds. • Graphic Organizer: Students will complete a graphic organizer about the periodic table. • Research: Students will select an element from the periodic table and research how it was discovered, who discovered it, where it can be found and uses in both nature and society. **Resources** • *Inquiry in Action: Investigating Matter through Inquiry*, 3rd edition. Permission is granted in advance for reproduction for classroom use. Please include "Reprinted with permission from Inquiry in Action, Third Edition, Copyright © 2007, American Chemical Society." • National Science Digital	

		Library, Science Digital Literacy Maps The Physical Setting: Atoms and Molecules http://strandmaps.nsdl.org/?id=SMS-MAP-1325 • National Science Digital Library, Science Refreshers http://nsdl.org/refreshers/science/ • *Science Curriculum Topic Study*: Particulate Nature of Matter (Atoms and Molecules) p. 169	

Unit 1

Standard 5.2 Physical Science: Physical science principles, including fundamental ideas about matter, energy and motion, are powerful conceptual tools for making sense of phenomena in physical, living and Earth systems science.

Strand B Changes in Matter: Substances can undergo physical or chemical changes to form new substances. Each change involves energy.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How does conservation of mass apply to the interaction of materials in a closed system?	**Content** When substances undergo chemical change, the number and kinds of atoms in the reactants are the same as the number and kinds of atoms in the products. The mass of the reactants is the same as the mass of the products. **CPI** **5.2.8.B.1** – Explain, using an understanding of the concept of chemical change, why the mass of reactants and the mass of products remain constant.	• Predict, sharing their reasoning, the result of combining iron or steel wool and water (forms rust). Explain the formation of rust using conceptual understanding of conservation of mass • Design and carry out an investigation to show that mass is conserved when substances undergo phase change. Engage in evidence-based arguments as they explore and refine their explanations for their data. • Design and carry out an investigation involving a	• Critical Thinking Questions • Conclusion • Dipstick Quiz • Performance Assessments • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks –such as oral presentations, debates, performances, displays, or publications –that demonstrate application of

		chemical change (e.g., Alka Seltzer and water). Compare the mass of the reactants with the mass of the products. Use data derived from the investigation to confirm or reject the principle of conservation of mass. • Lab Activity: Students will complete a chemical reaction and analyze what happens to the reactants during the reaction. • SmartBoard: Students will use the SmartBoard to demonstrate what happens during a chemical reaction to the reactants and products. • Graphic Organizer: Students will complete notes/graphic organizer/guided reading discussing conservation of mass. • Lab Activity:	learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application ***Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

		Students will be given unknown substances and must apply their knowledge of physical and chemical properties to determine the identity of the substances • Real World Application: Students will hypothesize why having knowledge of physical and chemical properties of substances can be beneficial in the real world. For example: knowing why certain chemicals shouldn't be combined, why is copper the best metal to use for wiring? **Resources** • *Inquiry in Action: Investigating Matter through Inquiry*, 3rd edition. Permission is granted in advance for reproduction for classroom use. Please include "Reprinted with permission	

		from Inquiry in Action, Third Edition, Copyright © 2007, American Chemical Society." • National Science Digital Library, Science Digital Literacy Maps The Physical Setting: Atoms and Molecules http://strandmaps.nsdl.org/?id=SMS-MAP-1325 • National Science Digital Library, Science Refreshers http://nsdl.org/refreshers/science/ • *Science Curriculum Topic Study*: Conservation of Matter p. 163	

Unit 2

Standard 5.2 Physical Science: Physical science principles, including fundamental ideas about matter, energy and motion, are powerful conceptual tools for making sense of phenomena in physical, living and Earth systems science.

Strand C Forms of Energy: Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, the natural world can be explained and is predictable.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How do we know that things have energy?	**Content** A tiny fraction of the light energy from the Sun reaches Earth. Light energy from the Sun is Earth's primary source of energy, heating Earth surfaces and providing the energy that results in wind, ocean currents, and storms **CPI** **5.2.8.C.1** – Structure evidence to explain the relatively high frequency of tornadoes in "Tornado Alley"	• Explore digital simulations to examine the cause and effect relationship between thermal energy from the sun and global ocean circulation patterns. Construct a written or oral explanation for the phenomenon. • Use data and computational tools to construct explanations for the observation that it always seems hotter in the city than in the suburbs during the summer. • Organize multiple data sets to engage in	• Summative Test • Critical Thinking Questions • Presentation • Exit Cards • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks –such as oral presentations, debates, performances, displays, or publications –that demonstrate application of

	Content Energy is transferred from place to place. Light energy can be thought of as traveling in rays. Thermal energy travels via conduction and convection. **CPI** **5.2.8.C.2** – Model and explain current technologies used to capture solar energy for the purposes of converting it to electrical energy	evidence-based arguments to explain the relatively high frequency of tornadoes in "Tornado Alley." • Identify all the energy forms and energy transformations in a Rube Goldberg machine or pinball machine. Share with class and explain reasoning. **Extension: Students will build their own Rube Goldberg machine that will include at least 3 different energy transformations and present it to the class via video, demonstration, or detailed poster. • In text or drawings, explain the mechanisms by which radiation, conduction, and convection could be used to heat and cook food – or given different cooking appliances (convection oven, heat lamp, open	learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application ***Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

		flame, stove top), identify which mechanism is utilized to cook the food. • Explore and explain how solar energy is being harnessed to provide easier, more environmentally friendly, access to basic needs in developing regions around the world (e.g., solar ovens, solar water purification systems, solar water pumps). • Diagram/Analyze: Students will diagram and analyze how the Sun's energy reaches the Earth and how that energy is transferred. • Demonstration: Students will use everyday objects to demonstrate conduction, convection and radiation, such as hot plates, boiling water, lava lamps, etc.	

		• Map Activity: Students will map Tornado Alley and discuss what weather phenomena cause it to be a hot spot for tornadoes. • Graphic Organizers: Students will complete notes/graphic organizers/guided reading about conduction, convection and radiation. **Resources** • *Inquiry in Action: Investigating Matter through Inquiry*, 3rd edition. Permission is granted in advance for reproduction for classroom use. Please include "Reprinted with permission from Inquiry in Action, Third Edition, Copyright © 2007, American Chemical Society." • National Science Digital Library, Science Digital Literacy Maps The Physical Setting: Atoms and Molecules http://strandmaps.nsdl.org/?id=SMS-MAP-1325	

		• National Science Digital Library, Science Refreshers http://nsdl.org/refreshers/science/ *Science Curriculum Topic Study*: Energy Transformation p. 213 Solar Weather and Climate p. 191	

Unit 2

Standard 5.2 Physical Science: Physical science principles, including fundamental ideas about matter, energy and motion, are powerful conceptual tools for making sense of phenomena in physical, living and Earth systems science.

Strand E Forces and Motion: It takes energy to change the motion of objects. The energy change is understood in terms of forces.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How can energy be transferred from one material to another? What happens to a material when energy is transferred to it?	**Content** An object is in motion when its position is changing. The speed of an object is defined by how far it travels divided by the amount of time it took to travel that far, **CPI** **5.2.8.E.1** – Calculate the speed of an object when given distance and time	• Make measurements and use graphing software to create graphs that support a written description of an object's motion to include position and speed as a function of time. • Make measurements and use graphing software to display a position-time graph for a moving object. • Use probeware to measure the speed of a moving object and display it using graphing software. • Stations: Students will solve speed problems.	• Conclusion • Critical Thinking Questions • Quiz • Performance Assessment • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks –such as oral presentations, debates, performances, displays, or publications –that demonstrate application of

		Extension: Students will also solve for distance and time by rearranging the speed formula. • Lab Activity: Students will create a lab that finds the distance and time an object travels, and then will use that information to find speed. • Graphing: Students will create graphs comparing the speed of objects. • Extended Constructed Response: How can a police officer determine how fast a car was traveling without the use of radar gun? **Resources • *Inquiry in Action: Investigating Matter through Inquiry*, 3rd edition. Permission is granted in advance for reproduction for classroom	learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application ***Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

		use. Please include "Reprinted with permission from Inquiry in Action, Third Edition, Copyright © 2007, American Chemical Society." • National Science Digital Library, Science Digital Literacy Maps The Physical Setting: Atoms and Molecules http://strandmaps.nsdl.org/?id=SMS-MAP-1325 • National Science Digital Library, Science Refreshers http://nsdl.org/refreshers/science/ *Science Curriculum Topic Study*: Work, Power, and Machines p. 227	

Unit 3

Standard 5.3 Life Science: Life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.

Strand A. Organization and Development: Living organisms are composed of cellular units (structures) that carry out functions required for life. Cellular units are composed of molecules, which also carry out biological functions.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
What do all living things have in common?	**Content** All organisms are composed of cells. In multicellular organisms, specialized cells perform specialized functions. Tissues, organs, and organ systems are composed of cells and function to serve the needs for food, air, and waste removal.	• Compare live or digital video images of a variety of single-celled organisms to multicellular organisms. Consider factors such as behavior, growth, development, movement, etc. to describe the differences. • Explain the division of labor among the levels of the hierarchy in multicellular organisms that allow these organisms to carry out necessary life processes, and how that may differ from single-celled organisms • Compare prepared slides or digital images of a variety of cells from human body systems (nervous, digestive, cardiac, circulatory etc.). Consider how the shape and structure of each cell type is related to the function of the cell. Describe the differences with respect to cell functioning.	• Do nows • Formative quizzes (dipsticks) • Exit cards • Analysis questions • Conclusions • Summative Test • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks –such as oral presentations, debates, performances, displays, or publications –that

	CPI **5.3.8.A.1** – Compare the benefits and limitations of existing as a single or multicellular organism. **Content** During the early development of an organism, cells differentiate and multiply to form the many specialized cells, tissues, and organs that compose the final organism. Tissues grow through cell division. **CPI** **5.3.8.A.2 –** Relate the structures of cells, tissues, organs, and systems to their functions in supporting life.	• Diagram/illustrate the stages of mitosis • Extended Constructed Response: Students will explain why the cells/tissues/components of various body systems have different shapes and why **Resources** • Teachers' Domain provides lesson plans and other multimedia resources (video clips and simulations) that support this CPI. http://www.teachersdomain.org/resource/tdc02.sci.life.stru.singlecell/ http://www.teachersdomain.org/resource/lsps07.sci.life.stru.celldivision/ http://www.teachersdomain.org/resource/tdc02.sci.life.stru.singlecell/ http://www.teachersdomain.org/resource/tdc02.sci.life.stru.different/	demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application ***For specific sample assessments: Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

Unit 4

Standard 5.3 Life Science: Life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.

Strand C. Interdependence : All animals and most plants depend on both other organisms and their environment to meet their needs.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
In what ways do other organisms interact within ecosystems?	**Content** Symbiotic interactions among organisms of different species can be classified as: • Producer/Consumer • Predator/Prey • Parasite/Host • Scavenger/Prey • Decomposer/Prey **CPI** **5.3.8.C.1** – Model the effect of positive and negative	• Illustrate patterns of how populations in a given area depend on each other for their basic needs. • Explain how energy resources of a community are shared through the interactions of producers, consumers, and decomposers. • Diagram the systems, order and organizations within and between populations. • Understand and use interrelationships between systems and equilibrium to explain the idea that each organism fills a specific role or niche in its community. • Extended Constructed Response/Research:	• Do nows • Formative quizzes (dipsticks) • Exit cards • Analysis questions • Conclusions • Summative Test • Extended reading assignments and research-based writing assignments that connect and extend

	changes in population's size on a symbiotic pairing.	Students will explain how humans can disrupt an ecosystem of their choosing and the impact that it will have on energy flow in that ecosystem. Example: deforestation, hunting, and pollution **Resources** • Annenberg Media's Teachers' Resources offer short video courses covering essential science content for teachers. http://www.learner.org/resources/series179.html • National Invasive Species Information Center (NISIC) provides data and information regarding invasive species, including covering Federal, State, local, and international sources. This site supports the performance assessment associated with the CPI. http://www.invasivespeciesinfo.gov/	the course curriculum and connect varied disciplines. • Projects or performance tasks –such as oral presentations, debates, performances, displays, or publications –that demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing

			assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application ***For specific sample assessments: Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

Unit 5

Standard 5.3 Life Science: Life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.

Strand D. Heredity and Reproduction: Organisms reproduce, develop, and have predictable life cycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How do organisms change as they go through their life cycle?	**Content** Some organisms reproduce asexually. In these organisms, all genetic information comes from a single parent. Some organisms reproduce sexually through which half of the genetic information comes from each parent. **CPI** **5.3.8.D.1** – Defend the concept that	• Work in groups to conduct experimental crosses using fruit flies. • Record the specific traits that appear in each generation (eye color, body color, wing type, etc) to determine the patterns of inheritance between generations. • Record the specific traits that appear in each generation (eye color, body color, wing type, etc) to determine the degree of variation between siblings of the same generation. • Explain how this variation occurs, justifying their claim using evidence. • Alter one environmental factor (temperature, light, etc.), then collect and analyze data.	• Do nows • Formative quizzes (dipsticks) • Exit cards • Analysis questions • Conclusions • Summative Test • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied

	through reproduction, genetic traits are passed from one generation to the next using evidence collected from observations of inherited traits. **Content** The unique combination of genetic material from each parent in sexually reproducing organisms results in the potential for variation. **CPI** **5.3.8.D.2 –** Explain the source of variations among siblings. **Content** Characteristics of organisms are influenced by	• Record the specific traits that appear in each generation (eye color, body color, wing type, etc) to determine if the offsprings' traits are altered in any way by the changed environmental factor, as compared to a control situation. • Diagram/illustrate meiosis • Complete and analyze Punnett squares • Enrichment Activity: Students will construct and analyze pedigree charts to predict and determine which traits are passed from parent to offspring. **Resources** • Annenberg Media's Teachers' Resources offer short video courses covering essential science content for K-6 teachers. http://www.learner.org/resources/series179.html • Pearson's LabBench program offers an interactive site that allows students to explore the content associated with this CPI. http://www.phschool.com/science/biology_place/labbench/lab7/intro.html	disciplines. • Projects or performance tasks – such as oral presentations, debates, performances, displays, or publications –that demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation.

	heredity and/or their environment. **CPI** **5.3.8.D.3** – Describe the environmental conditions or factors that may lead to a change in a cell's genetic information or to an organism's development and how these changes are passed on.		• Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application ***For specific sample assessments: Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

Unit 6

Standard 5.4 Earth System Science: The Earth operates as a set of complex and dynamic interconnected systems, and is a part of the all encompassing system of the Universe.

Strand A. Objects in the Universe: Our Universe has been expanding and evolving for 13.7 billion years under the influence of gravitational and nuclear forces. As gravity governs its expansion, organizational patterns, and the movement of celestial bodies, nuclear forces within stars govern its evolution through the processes of stellar birth and death. These processes also governed the formation of our Solar System 4.6 billion years ago.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
What predictable, observable patterns occur as a result of the interaction between the Earth, Moon, and Sun? What causes these patterns?	**Content** The relative positions and motions of the Sun, Earth, and Moon result in the phases of the moon, eclipses, and the daily and monthly cycle of tides. **CPI** **5.4.8.A.1** Analyze moon phase, eclipse and tidal data to construct models that explain how the relative positions and motions of the Sun, Earth, and Moon cause these three phenomena.	Create their own diagrams to illustrate explanations for tidal anomalies. See NOVA on Teachers Domain: Tidal Curiosities at: http://www.teachersdomain.org/ • resource/phy03.sci.phys.matter.curiosities • Engage in Catch A Wave, an educational project for students that uses online real time data, to guide student discovery of the causes and effects of ocean waves and tides. See Catch A Wave at: http://www.ciese.org/curriculum/ tideproj/index.shtml	• Lab journals/ student notebook • Homework • Lab Report • Performance Assessments • Quizzes • Summative Test • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks –such as oral presentations, debates, performances, displays, or publications –that

	Content The regular and predictable motion of objects in the solar system (Kepler's Laws) is explained by gravitational forces. **CPI** **5.4.8.A.4** Analyze data regarding the motion of comets, planets and moons to find general patterns of orbital motion.	• Participate in a kinesthetic classroom activity designed to help better understand moon phases and eclipses. See NASA Educator's Guide to Moon Phases at: http://www.solarviews.com/eng/edu/moonphas.htm • Have students act out the parts of the solar and lunar eclipses so that they are able to see the position of each part. • Generate scale models of the Earth, Moon and Sun both in size and distances, when given data tables. • Model how moon phases, eclipses, and tides occur while using materials such as lamps and Styrofoam spheres to effectively show the relationships among the 3 bodies • Create an orrery model of the Solar System that illustrates the relative motions and positions of bodies in the Solar System. Works together as a class	demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application ***Information can be found on the NJDOE site: http://www.state.nj.us/ education/cccs/cad/5/***

		to create a human-powered orrery to model the movements of the four inner planets. Assist in setting up this moving model of the Solar System and take turns playing the roles of Mercury, Venus, Earth, and Mars. See NASA's Planetary Motions. A classroom activity centered around a Human Orrery: http://kepler.nasa.gov/ed/pdf/ HumanOrrery.pdf • Observe the orrery in motion, and then form conclusions about the orbital periods of the inner planets. Afterwards, predict as a class, the orbital periods of the outer planets using the mapped scale model. • Investigate and debate how Galileo's observations of the phases of Venus persuade him of the true nature of the solar system. • Enrichment: Students will calculate the force of gravity the different	

		planets in our solar system and explain why there is a difference. **Resources** • National Science Digital Library, Science Digital Literacy Maps Historical Perspectives: Copernican Revolution http://strandmaps.nsdl.org/?id=SMS-MAP-2312 • NSDL Collection K-12 Short Cuts: Middle School http://nsdl.org/resources_for/k12_teachers/middle-school.php • *Science Curriculum Topic Study*: Motion of Planets, Moons, and Stars, p.197	

Unit 7

Standard 5.4 Earth System Science: The Earth operates as a set of complex and dynamic interconnected systems, and is a part of the all encompassing system of the Universe

Strand B. History of Earth: From the time that the earth formed from a nebula 4.6 billion years ago, it has been evolving as a result of geologic, biological, physical and chemical processes.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How do geologic events occurring today provide insight Earth's past?	**Content** Today's planet is very different than early Earth. Evidence for one-celled forms of life, bacteria, extends back more than 3.5 billion years. **CPI** **5.4.8.B.1** Correlate the evolution of organisms and the environmental conditions on Earth as they changed throughout geologic time	• Use the Deep Time interactive timeline to find out: o When fish, reptiles, birds, mammals, and humans appeared in geologic time. o What geological changes were occurring at the time of their appearance. o How has the complexity of life changed over time. See: Teachers Domain: Deep Time at http://www.teachersdomain.org/resource/tdc02.sci.ess.earthsys.deeptime/ • Observe fossil evidence of bacteria as it existed over geologic time and compare it to bacteria as it exists today. • Investigate and explain the mechanisms for how changes in Earth's atmosphere affected the kinds and distribution of life forms. See Teachers Domain, Life before Oxygen at:	• Lab journals/ student notebook • Homework • Lab Report • Performance Assessments • Quizzes • Summative Test • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks – such as oral

		http://www.teachersdomain.org/resource/tdc02.sci.ess.earthsys.stetteroxy/ • Research/Extended Constructed Response: Students will select a period of their choosing from the Geologic Time Scale and describe the events that occurred that designated its beginning and end, as well as what species roamed the Earth and the conditions that existed at that time.	presentations, debates, performances, displays, or publications –that demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and

	Content Fossils provide evidence of how life and environmental conditions have changed. **CPI** **5.4.8.B.2** Evaluate the appropriateness of increasing the human population in a region (e.g., barrier islands, pacific northwest, Midwest United States) based on the region's history of catastrophic events such as volcanic eruptions, earthquakes, and floods.	• Explore and explain why the Grand Canyon is such a valuable site for geologists studying the history of the changing Earth. See NOVA on Teachers Domain, The Grand Canyon: Evidence of Earth's Past at: http://www.teachersdomain.org/resource/ess05.sci.ess.earthsys.nautiloid/ • Create a geologic time wheel that spans from 3.5 billion years ago to present day. • Create a scale model of geologic time with significant known geologic events plotted along the timeline. • Identify the eras and periods of geologic time, and the rock and fossil evidence that support the transition from one time period to the next. • Observe fossil evidence of bacteria as it existed over geologic time and compare it to bacteria as it exists today. • Sequence fossil remains based on the time periods in which they existed, and describe changes in sophistication of these organisms over geologic time. **Resources** • National Science Digital Library, Science Digital Literacy Maps The Living Environment: Biological Evolution	application ***Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

		http://strandmaps.nsdl.org/ ?id=SMS-MAP-1430 • Historical perspectives: Moving the Continents http://strandmaps.nsdl.org/ ?id=SMS-MAP-2355 • NSDL Collection K-12 Short Cuts: Middle School http://nsdl.org/resources_for/k12_teachers/middle-school.php • *Science Curriculum Topic Study*: Earth History, p.176	

Unit 8

Standard 5.4 Earth System Science: The Earth operates as a set of complex and dynamic interconnected systems, and is a part of the all encompassing system of the Universe

Strand C. Properties of Earth Materials: The Earth's composition is unique, related to the origin of our solar system, and provides us with the raw resources needed to sustain life.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How do changes in one part of an Earth system affect other parts of the system?	**Content** Soil consists of weathered rocks and decomposed organic material from dead plants, animals, and bacteria. Soils are often found in layers, each having a different chemical composition and texture. The atmosphere has a different physical and chemical composition at different elevations. **CPI** **5.4.8.C.3** Model the vertical structure of the atmosphere using information from active	• Identify the gases in the atmosphere, and explain why there is variation in some of the gases (water vapor, carbon dioxide) at different locations around the globe and at different altitudes. • Relate the location and construction of active and passive remote sensing satellites to the data collected. • Apply the data collected by satellites to create a scale model of the vertical (physical and chemical) structure of the Earth's atmosphere that describes how the chemical and physical properties of each layer affect the existence of life on Earth. • Enrichment: Students will explain how various	• Lab journals/student notebook • Homework • Lab Report • Performance Assessments • Quizzes • Summative Test • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks – such as oral presentations, debates, performances,

	and passive remote sensing tools (e.g., satellites, balloons, and/or ground based sensors) in the analysis.	events (volcanic eruption, pollution, etc.) can cause changes in one Earth system but impact others. **Resources** • National Science Digital Library, Science Digital Literacy Maps The Physical Setting: Weather and Climate http://strandmaps.nsdl.org/?id=SMS-MAP-1698 • NSDL Collection K-12 Short Cuts: Middle School http://nsdl.org/resources_for/k12_teachers/middle-school.php • *Science Curriculum Topic Study* Air and Atmosphere, p.175	displays, or publications –that demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application ***Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

Unit 9

Standard 5.4 Earth System Science: The Earth operates as a set of complex and dynamic interconnected systems, and is a part of the all encompassing system of the Universe

Strand D. Tectonics: The theory of Plate Tectonics provides a framework for understanding the dynamic processes within and on the Earth.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
To what extent does the exchange of energy within the Earth drive geologic events on the surface?	**Content** The Earth is layered with a lithosphere; hot, convecting mantle; and dense, metallic core. **CPI** **5.4.8.D.1** Model the interactions between the layers of the Earth.	• Students can plot on a map depicting the plate boundaries various earthquakes and volcanoes to gain an understanding that they occur along plate boundaries. • Describe and compare the characteristics of each layer of the Earth. • Describe how technology has influenced what we know about the internal structure of Earth. • Investigate the role of the transfer of energy in geophysical processes that create unique landforms. **Extension: Students will select a landform, caused by the movement of tectonic plate, of their choosing and research how it formed, its location, and additional information on the landform.	• Lab journals/student notebook • Homework • Lab Report • Performance Assessments • Quizzes • Summative Test • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks –

	Content Major geological events, such as earthquakes, volcanic eruptions, and mountain building, result from the motion of plates. Mapping of the Mid-Atlantic Ridge, revealing sea floor spreading, and subduction zones are evidence for the theory of plate tectonics. **CPI** **5.4.8.D.2** Present evidence to support arguments for the theory of plate motion.	• Locate and map current evidence and data, such as volcanism, earthquakes, and ocean features (e.g., mid-ocean ridges and trenches), to reveal the location of plate margins. • Apply historical field evidence, such as the location of fossils, glacial moraines, and rock structures, to the theory of plate tectonics. • Create explanations for the evidence of plate tectonics that includes our current understanding of the Earth's interior. **Resources** • National Science Digital Library, Science Digital Literacy Maps The Physical Setting: Plate Tectonics http://strandmaps.nsdl.org/?id=SMS-MAP-0049 • NSDL Collection K-12 Short Cuts: Middle School http://nsdl.org/resources_for/k12_teachers/middle-school.php • *Science Curriculum Topic Study* Plate Tectonics, p.182	such as oral presentations, debates, performances, displays, or publications –that demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application ***Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

Unit 10

Standard 5.4 Earth System Science: The Earth operates as a set of complex and dynamic interconnected systems, and is a part of the all encompassing system of the Universe

Strand E. Energy in Earth Systems: Internal and external sources of energy drive the Earth system.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
What is the role of the sun in energy transfer in the atmosphere and in the oceans?	**Content** The Sun provides energy for plants to grow and drives convection within the atmosphere and oceans, producing winds, ocean currents, and the water cycle. **CPI** **5.4.8.E.1** Explain how energy from the Sun is transformed or transferred in global wind circulation, ocean circulation, and the water cycle.	• Engage in an interdisciplinary project, such as Gulf Stream Voyage, an online multidisciplinary project which utilizes both real time data and primary source materials to guide students to discover the science and history of the Gulf Stream. Investigate this great ocean current, how it affects the Atlantic Ocean and some of mankind's experiences dealing with it. See Gulf Stream Voyage at: http://www.k12science.org/curriculum/gulfstream/index.shtml. **Resources** • National Science Digital Library, Science Digital Literacy Maps The Physical Setting: Weather	• Lab journals/student notebook • Homework • Lab Report • Performance Assessments • Quizzes • Summative Test • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks – such as oral presentations, debates, performances, displays,

		and Climate http://strandmaps.nsdl.org/?id=SMS-MAP-1698 • NSDL Collection K-12 Short Cuts: Middle School http://nsdl.org/resources_for/k12_teachers/middle-school.php • *Science Curriculum Topic Study*: Weather and Climate, p.191	or publications –that demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application ***Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

Unit 11

Standard 5.4 Earth System Science: The Earth operates as a set of complex and dynamic interconnected systems, and is a part of the all encompassing system of the Universe

Strand F. Weather and Climate: Earth's weather and climate system are the result of complex interactions between land, ocean, ice and atmosphere.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How do changes in one part of an Earth system affect other parts of the system?	**Content** Global patterns of atmospheric movement influence local weather. **CPI** **5.4.8.F.1** Determine the origin of local weather by exploring national and international weather maps.	• Monitor the weather environment and make predictions about the weather up to 48 hours before special outdoor events. See Exploring the Environment, Weather or Not? at: http://www.cotf.edu/ete/modules/weathernot/weathernot.html • Join schools from around the world as they try to figure out how proximity to the equator affects average daily temperature and hours of sunlight. See: The Sun Times at: http://www.ciese.org/curriculum/tempproj3/en/guideinformation.shtml • Generate graphs of multiple weather parameters to establish relationships among	• Lab journals/student notebook • Homework • Lab Report • Performance Assessments • Quizzes • Summative Test • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks – such as oral

		weather variables. • Apply knowledge of weather patterns to analyze case studies of when weather impacted a historical event. • Enrichment: Students will be given weather maps and be able to analyze them to determine the conditions in various regions.	presentations, debates, performances, displays, or publications –that demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application
	Content Climate is influenced locally and globally by atmospheric interactions with land masses and bodies of water. **5.4.8.F.2** Explain the mechanisms that cause varying daily temperature ranges between a coastal community and a community located in the interior of the country.	• Analyze climatographs (graph of the average monthly temperature and rainfall quantities for a location) for coastal and inland locations to identify and generalize patterns. • Analyze diurnal temperature patterns for coastal and inland locations to identify and generalize patterns. • Explain how the ocean water at the coasts influences the atmospheric temperatures during the day, night, and year. • Explain how ocean-atmosphere interactions create breezes on	

		the coast. **Resources** • National Science Digital Library, Science Digital Literacy Maps The Physical Setting: Weather and Climate http://strandmaps.nsdl.org/?id=SMS-MAP-1698 • NSDL Collection K-12 Short Cuts: Middle School http://nsdl.org/resources_for/k12_teachers/middle-school.php • *Science Curriculum Topic Study*: Weather and Climate, p.191	***Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

Unit 12

Standard 5.4 Earth System Science: The Earth operates as a set of complex and dynamic interconnected systems, and is a part of the all encompassing system of the Universe

Strand G. Biogeochemical Cycles: The biogeochemical cycles in the Earth System include the flow of microscopic and macroscopic resources from one reservoir in hydrosphere, geosphere, atmosphere, or biosphere to another, are driven by the Earth's internal and external sources of energy, and are impacted by human activity.

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How do changes in one part of the Earth system affect other parts of the system and in what ways can Earth processes be explained as interactions among spheres?	**Content** Investigations of environmental issues address underlying scientific causes and may inform possible solutions. **CPI** **5.4.8.G.2** Investigate a local or global environmental issue by defining the problem, researching possible causative factors, understanding the underlying science, and evaluating the benefits and risks of alternative solutions.	• Design an experiment that determines if the precipitation in their area is acidic. Graph amounts of precipitation, pH levels, and general weather conditions for the course of the experiment. On the basis of their findings, provide an analysis of the problem. If they can identify the sources of acid rain, they may name them, but they must be able to substantiate their allegation. See Acid and Its Effect found at:http://pals.sri.com/tasks/5-8/AcidRain/ • Engage in the Problem Based Learning Module titled Exploring the Environment: Global Climate Change at: http://www.cotf.edu/ete/modules/climate/GCsituation.	• Lab journals/student notebook • Homework • Lab Report • Performance Assessments • Quizzes • Summative Test • Extended reading assignments and research-based writing assignments that connect and extend the course curriculum and connect varied disciplines. • Projects or performance tasks –such as oral presentations, debates, performances, displays, or publications –that

		html • Enrichment: Students will analyze the increase of carbon dioxide levels over recent years and its impact on the carbon cycle as well as the earth's systems. **Resources** • National Science Digital Library, Science Digital Literacy Maps The Physical Setting: Use of Earth's Resources http://strandmaps.nsdl.org/?id=SMS-MAP-1699 • The Living Environment: Interdependence of Life http://strandmaps.nsdl.org/?id=SMS-MAP-2122 • NSDL Collection K-12 Short Cuts: Middle School http://nsdl.org/resources_for/k12_teachers/middle-school.php • *Science Curriculum Topic Study* Environmental Impacts of Science and Technology, p.258	demonstrate application of learning in one or more discipline areas to relevant or real-world situations and to community concerns. • Open-ended investigations in which the student selects the questions and designs the research. • Writing assignments that use a variety of types such as descriptions, persuasion, and explanation. • Extensive opportunities for problem-solving experiences through imagination, critical analysis, and application ***Information can be found on the NJDOE site: http://www.state.nj.us/education/cccs/cad/5/***

New Jersey Core Curriculum Content Standards

Located on the NJ Department of Education website

Academic Area

Science