Lab-Aids Correlations for

NEXT GENERATION SCIENCE STANDARDS

MIDDLE SCHOOL LEVEL – GRADES 6-8

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This document is intended to show how the SEPUP 3rd edition materials align with the *Next Generation Science Standards*[1] and Common Core documents.

ABOUT OUR PROGRAMS

Lab-Aids has maintained its home offices and operations in Ronkonkoma, NY, since 1963. We publish over 200 kits and core curriculum programs to support science teaching and learning, grades 6-12. All core curricula support an inquiry-driven pedagogy, with support for literacy skill development and with assessment programs that clearly show what students know and are able to do as a result of program use. All programs have extensive support for technology and feature comprehensive teacher support. For more information please visit www.lab-aids.com and navigate to the program of interest.

SEPUP

Materials from the Science Education for Public Understanding Program (SEPUP) are developed at the Lawrence Hall of Science, at the University of California, Berkeley, and distributed nationally by LAB-AIDS, Inc. Since 1987, development of SEPUP materials has been supported by grants from the National Science Foundation and other public and private sources. SEPUP programs include student books, equipment kits, teacher materials, and online digital content, and are available as full year courses, or separately, as units, each taking 3-8 weeks to complete, as listed below.

Middle Level, Grades 6-8

Earth Science	**Life Science**	**Physical Science**
Earth's Resources	Biomedical Engineering	Chemistry of Materials
Geological Processes	Body Systems	Chemical Reactions
Land, Water, and Human Interactions	Ecology	Energy
Solar System and Beyond	From Cells to Organisms	Force and Motion
Weather and Climate	Evolution	Fields and Interactions
	Reproduction	Waves

[1] http://www.nextgenscience.org/next-generation-science-standards

ABOUT THE NEXT GENERATION SCIENCE STANDARDS

The National Academy of Sciences, Achieve, the American Association for the Advancement of Science, and the National Science Teachers Association have collaborated over several years to develop the *Next Generation Science Standards* (NGSS). The first step of the process was led by The National Academies of Science, a non-governmental organization commissioned in 1863 to advise the nation on scientific and engineering issues. On July 19, 2011, the National Research Council (NRC), the functional staffing arm of the National Academy of Sciences, released the *Framework for K-12 Science Education*.

The *Framework* was a critical first step because it is grounded in the most current research on science and science learning and it identifies the science all K–12 students should know. The second step in the process was the development of standards grounded in the NRC Framework. A group of 26 lead states and writers, in a process managed by Achieve, has been working since the release of the Framework to develop K-12 *Next Generation Science Standards*. The final release of the Standards was in April 2013. States, districts, and schools have worked to implement these standards since then.

The *Next Generation Science Standards* (NGSS) provide an important opportunity to improve not only science education but also student achievement. Based on the *Framework for K–12 Science Education*, the NGSS are intended to reflect a new vision for American science education. *The Next Generation Science Standards* are student performance expectations – NOT curriculum. These performance expectations clarify the expectations of what students will know and be able to do by the end of the grade or grade band.

As the reader knows, the *Standards* represent content from several domains: (1) science and engineering practices; (2) crosscutting concepts; (3) the disciplines of life, earth, and physical science, as set forth in the *Next Generation Science Framework* (NRC, 2012). The Standards themselves are written as performance indicators, and content from the Common Core (http://www.corestandards.org/) is included. The following middle level standard from the life sciences is used to show the basic structure. Standards, as performance indicators, are in the white box on top, and the relevant Practices, Disciplinary Core Ideas, and Crosscutting Concepts are listed below in the blue, orange, and green boxes, respectively. Clarification Statements, in red, list assessment boundaries or further describe the standard; statements marked with an asterisk (*) denote integration of engineering content.

Various other appendices from the Standards documents describe other important elements, such as DCI progressions, STS, nature of science, and more.

MS-LS3 Heredity: Inheritance and Variation of Traits

MS-LS3 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

MS-LS3-1. **Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.** [Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]

MS-LS3-2. **Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.** [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena. (MS-LS3-1),(MS-LS3-2)

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. *(secondary to MS-LS3-2)*

LS3.A: Inheritance of Traits

- Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1)
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

LS3.B: Variation of Traits

- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)
- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2)

Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)

Connections to other DCIs in this grade-band: **MS.LS1.A** (MS-LS3-1); **MS.LS4.A** (MS-LS3-1)

Articulation across grade-bands: **3.LS3.A** (MS-LS3-1),(MS-LS3-2); **3.LS3.B** (MS-LS3-1),(MS-LS3-2); **HS.LS1.A** (MS-LS3-1); **HS.LS1.B** (MS-LS3-1),(MS-LS3-2); **HS.LS3.A** (MS-LS3-1),(MS-LS3-2); **HS.LS3-B** (MS-LS3-1),(MS-LS3-2)

Common Core State Standards Connections:

ELA/Literacy –

ABOUT THE LAB-AIDS CITATIONS

The following tables are presented in a Disciplinary Core Idea arrangement – Earth Space Science (ESS), Life Science (LS), Physical Science (PS) and Engineering, Technology and Applications of Science (ETS)

Citations included in the correlation document are as follows:

* indicates where Performance Expectation is assessed
Unit title, Activity Number
The Chemistry of Materials, 14

NGSS Performance Expectations	MS-PS1-2
Science and Engineering Practices	Planning and Carrying Out Investigations
Crosscutting Concepts	Structure and Function
Disciplinary Core Ideas	MS-PS1.A
Common Core English-Language Arts	RST.6-8.3
Common Core Mathematics	MP.2

ISSUES AND SCIENCE NGSS UNITS

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
MS-ESS1-1: Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	*Solar System and Beyond:* 2, 3, 4, 5*, 6, 7, 8, 9*	Analyze and Interpret Data Constructing Explanations and Designing Solutions Developing and Using Models	MS-ESS1.A MS-ESS1.B	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to Nature of Science Patterns Scale, Proportion, and Quantity Systems and System Models	RST.6-8.2 WHST.6-8.2 SL.8.5 6.RP.A.1
MS-ESS1-2: Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.	*Solar System and Beyond:* 10, 11, 12, 14, 15, 16*	Analyze and Interpret Data Connections to the Nature of Science Developing and Using Models Using Mathematics and Computational Thinking	MS-ESS1.A MS-ESS1.B	Connections to Engineering, Technology, and Applications of Science Connections to Nature of Science Patterns Scale, Proportion, and Quantity Systems and System Models	RST.6-8.1 WHST.6-8.2 WHST.6-8.9 SL.8.4 6.RP.A.1 6.RP.A.3 MP.2 MP.4

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
MS-ESS1-3: Analyze and interpret data to determine scale properties of objects in the solar system.	*Solar System and Beyond:* 1, 10, 11, 12, 13*	Analyze and Interpret Data Developing and Using Models Using Mathematics and Computational Thinking	MS-ESS1.A MS-ESS1.B	Connections to Engineering, Technology, and Applications of Science Scale, Proportion, and Quantity Systems and System Models	WHST.6-8.2 SL.8.4 6.RP.A.1 6.RP.A.3 MP.2 MP.4
MS-ESS1-4: 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.	*Earth's Resources:* 9, 10, 11, 12*	Constructing Explanations and Designing Solutions Developing and Using Models Planning and Carrying Out Investigations Connections to the Nature of Science	MS-ESS1.C	Patterns Scale, Proportion, and Quantity Stability and Change	RST.6-8.3 WHST.6-8.1 WHST.6-8.9
MS-ESS2-1: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.	*Geological Processes:* 2, 5, 8, 9, 10, 11, 13, 14, 15*	Analyze and Interpret Data Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models	MS-ESS1.C MS-ESS2.A MS-ESS2.B MS-ESS2.C MS-ESS3.A MS-ESS3.B	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Energy and Matter Patterns	RST.6-8.2 RST.6-8.3 RST.6-8.4 WHST.6-8.1 WHST.6-8.2 SL.8.1 6.RP.A.1 MP.2

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations Using Mathematics and Computational Thinking		Scale, Proportion, and Quantity Stability and Change Structure and Function Systems and System Models	
MS-ESS2-2: Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.	*Geological Processes:* 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13*	Analyze and Interpret Data Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out	MS-ESS1.C MS-ESS2.A MS-ESS2.B MS-ESS2.C MS-ESS3.A MS-ESS3.B	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Energy and Matter Patterns Scale, Proportion, and Quantity Stability and Change Structure and Function	RST.6-8.1 RST.6-8.2 RST.6-8.3 WHST.6-8.1 WHST.6-8.2 WHST.6-8.9 SL.8.1 6.RP.A.1 6. NS.C.5 7. RP.A.2 MP.4

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Investigations Using Mathematics and Computational Thinking		Systems and System Models	
	Land, Water, and Human Interactions: 3, 4, 6, 7, 8, 10, 11, 12, 13, 14*	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	MS-ETS1.A MS-ETS1.B MS-ESS2.A MS-ESS2.C MS-ESS3.C MS-LS2.A MS-LS2.C	Cause and Effect Connections to Engineering, Technology, and Applications of Science Energy and Matter Patterns Scale, Proportion, and Quantity Stability and Change	RST.6-8.1 RST.6-8.3 RST.6-8.9 WHST.6-8.2 WHST.6-8.9 6.RP.A.1 6.SP.B.5 MP.2 MP.4

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
MS-ESS2-3: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.	*Geological Processes:* 10, 11, 12, 13, 14*	Analyze and Interpret Data Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Planning and Carrying Out Investigations Obtaining, Evaluating, and Communicating Information	MS-ESS1.C MS-ESS2.A MS-ESS2.B MS-ESS3.B	Cause and Effect Connections to the Nature of Science Patterns Scale, Proportion, and Quantity Stability and Change System and System Models	RST.6-8.2 WHST.6-8.1 WHST.6-8.2 SL.8.1 6.RP.A.1 7.RP.A.2 MP.2
MS-ESS2-4: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.	*Land, Water, and Human Interactions:* 2, 5, 7, 8, 9*	Asking Questions and Defining Problems Constructing Explanations and Designing Solutions Developing and Using Models Planning and Carrying Out Investigations	MS-ETS1.A MS-ESS2.A MS-ESS2.C MS-ESS3.C MS-PS2.A	Cause and Effect Connections to Engineering, Technology, and Applications of Science Energy and Matter Scale, Proportion, and Quantity Stability and Change	RST.6-8.1 RST.6-8.3 RST.6-8.9 WHST.6-8.2

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
MS-ESS2-5: Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.	*Weather and Climate:* 2, 3, 7, 9, 10, 11, 12, 13*	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Planning and Carrying Out Investigations	MS-ETS1.B MS-ETS1.C MS-ESS2.C MS-ESS2.D MS-ESS3.D MS-LS4.C	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Energy and Matter Patterns Structure and Function System and System Models	RST.6-8.3 RST.6-8.7 RST.6-8.9 WHST.6-8.7 SL.8.1 SL.8.4 MP.2
MS-ESS2-6: Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.	*Weather and Climate:* 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14*	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence	MS-ESS2.C MS-ESS2.D MS-ESS3.D MS-LS4.C MS-PS3.B	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Energy and Matter Patterns Systems and System Models	RST.6-8.3 RST.6-8.7 WHST.6-8.7 SL.8.1 SL.8.4 MP.2

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Planning and Carrying Out Investigations			
MS-ESS3-1: Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.	*Geological Processes:* 2, 16*, 17*	Analyzing and Interpreting Data Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	MS-ESS2.A MS-ESS2.C MS-ESS3.A	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Patterns Scale, Proportion, and Quantity Structure and Function Systems and System Models	RST.6-8.2 RST.6-8.3 WHST.6-8.1 WHST.6-8.7 SL.8.1
	Earth's Resources: 1, 2, 3, 5, 7, 8, 14*	Analyzing and Interpreting Data Asking Questions and Defining Problems Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence	MS-ESS3.A MS-ESS3.C	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Scale, Proportion, and Quantity Stability and Change	RST.6-8.1 RST.6-8.3 WHST.6-8.1 WHST.6-8.2 WHST.6-8.9 7.RP.A.2

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Obtaining, Evaluating, and Communicating Information		Structure and Function	
MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.	*Geological Processes:* 1, 3, 4, 6, 7, 8, 11, 18*	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Using Mathematics and Computational Thinking	MS-ESS1.C MS-ESS2.A MS-ESS2.C MS-ESS3.B	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Patterns Scale, Proportion, and Quantity Stability and Change Structure and Function Systems and System Models	RST.6-8.1 RST.6-8.2 RST.6-8.3 RST.6-8.4 WHST.6-8.1 WHST.6-8.2 WHST.6-8.9 SL.8.1 6.NS.C.5 MP.2 MP.4
MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	*Land, Water, and Human Interactions:* 1, 3, 4, 5, 6, 9, 13, 14, 15, 16*	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions	MS-ESS2.A MS-ESS2.C MS-ESS3.C MS-LS2.A MS-LS2.C	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Energy and Matter	RST.6-8.1 RST.6-8.3 RST.6-8.9 WHST.6-8.2 WHST.6-8.9 SL.8.4 6.RP.A.1 6.SP.B.5 MP.4

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations		Patterns Scale, Proportion, and Quantity Stability and Change	
MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	*Earth's Resources:* 2, 4, 6, 13*	Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	MS-ESS3.A MS-ESS3.C	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Systems and System Models	RST.6-8.1 RST.6-8.3 WHST.6-8.1 WHST.6-8.9 6.SP.B.5 7.RP.A.2
	Evolution: 14	Analyzing and Interpreting Data Engaging in Argument from Evidence	MS-ESS3.C MS.LS4.A MS.LS4.B MS.LS4.D	Cause and Effect Connections to the Nature of Science Patterns	RST.6-8.7 WHST.6-8.9
MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	*Weather and Climate:* 1, 10, 14, 15, 16*	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to the Nature of	MS-ESS2.C MS-ESS2.D MS-ESS3.C MS-ESS3.D	Connections to the Nature of Science Energy and Matter Scale, Proportion, and Quantity	RST.6-8.7 WHST.6-8.1 SL.8.1 MP.4

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Science Developing and Using Models Planning and Carrying Out Investigations		Stability and Change Systems and System Models	
MS-LS1-1: Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.	*From Cells to Organisms:* 1, 2, 3, 4, 9*	Analyzing and Interpreting Data Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations Using Mathematics and Computational Thinking	MS-LS1.A MS-LS1.C MS-PS3.D	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Energy and Matter Patterns Scale, Proportion, and Quantity Structure and Function Systems and System Models	RST.6-8.3 RST.6-8.7 RST.6-8.9 WHST.6-8.2 WHST.6-8.7 WHST.6-8.9 SL.8.5
MS-LS1-2: Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.	*From Cells to Organisms:* 6, 7, 8*	Analyzing and Interpreting Data Connections to the Nature of Science Constructing Explanations and	MS-LS1.A	Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science	RST.6-8.3 RST.6-8.7 RST.6-8.9 WHST.6-8.2 WHST.6-8.7 WHST.6-8.9

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Designing Solutions Developing and Using Models Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations		Scale, Proportion, and Quantity Structure and Function Systems and System Models	SL.8.5
MS-LS1-3: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.	*From Cells to Organisms*: 10, 14, 15	Analyzing and Interpret Data Constructing Explanations and Designing Solutions Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Using Mathematics and Computational Thinking	MS-LS1.A	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Patterns Scale, Proportion, and Quantity	RST.6-8.2 RST.6-8.3 RST.6-8.7 RST.6-8.9 WHST.6-8.9
	Body Systems: 1, 2, 3, 4, 9, 10, 11, 12*	Analyzing and Interpret Data Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from	MS-LS1.A MS-PS3.D	Cause and Effect Connections to the Nature of Science Structure and Function Systems and System Models	RST.6-8.2 RST.6-8.3 RST.6-8.4 RST.6-8.7 RST.6-8.9 WHST.6-8.1 WHST.6-8.2 WHST.6-8.9 SL.8.1 6.SP.B.4

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations Using Mathematics and Computational Thinking			
MS-LS1-4: Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	*Reproduction:* 10*, 11*	Constructing Explanations and Designing Solutions Developing and Using Models	MS-LS1.B MS-LS3.A MS-LS3.B	Cause and Effect Patterns	RI.6.8 RST.6-8.1 RST.6-8.4 WHST.6-8.1 6.SP.A.2 6.SP.B.4 6.SP.B.5
MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	*Reproduction:* 1, 7*	Asking Questions and Defining Problems Obtaining, Evaluating, and Communicating Information	MS-LS3.A MS-LS1.B	Cause and Effect Connections to the Nature of Science Structure and Function	RST.6-8.2 SL.8.1 WHST.6-8.9 6.RP.A.1 6.SP.B.5
MS-LS1-6: Construct a scientific explanation based on evidence for	*From Cells to Organisms*:	Constructing Explanations and Designing Solutions	MS-LS1.A MS-LS1.C MS-PS3.D	Energy and Matter Structure and Function	RST.6-8.3

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	12, 13*				
MS-LS1-7: Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.	*From Cells to Organisms*: 5, 11*	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Developing and Using Models Planning and Carrying Out an Investigation	MS-LS1.A MS-LS1.C MS-PS3.D	Energy and Matter	RST.6-8.2 RST.6-8.3 RST.6-8.9
	Body Systems: 5	Constructing Explanations and Designing Solutions Developing and Using Models	MS-LS1.A MS-LS1.C	Energy and Matter	RST.6-8.2 RST.6-8.9
MS-LS1-8: Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	*Body Systems:* 6, 7, 8*	Analyzing and Interpreting Data Obtaining, Evaluating, and Communicating Information Planning and Carrying Out an Investigation	MS-LS1.D	Cause and Effect	RST.6-8.4 6.SP.B.4
MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and	*Ecology:* 5, 6, 9*	Analyzing and Interpret Data Connections to the Nature of Science Constructing Explanations and Designing Solutions	MS-LS2.A	Cause and Effect Connections to the Nature of Science Energy and Matter Patterns	RST.6-8.1 RST.6-8.3 RST.6-8.7 RST.6-8.8 SL.8.4 SL.8.5

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
populations of organisms in an ecosystem.		Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations		Stability and Change Systems and System Models	WHST.6-8.1 WHST.6-8.9 6.EE.C.9 6.RP.A.1 6.RP.A.3 6.SP.B.5 MP.2 MP.4
MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	*Ecology:* 2, 8, 10*	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	MS-LS2.A	Cause and Effect Connections to the Nature of Science Energy and Matter Patterns Stability and Change Systems and System Models	RST.6-8.1 RST.6-8.3 RST.6-8.8 SL.8.4 SL.8.5 WHST.6-8.9 6.RP.A.1 6.RP.A.3 MP.2 MP.4
MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving	*Ecology:* 7, 8, 11, 12*	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Developing and Using Models Planning and Carrying Out	MS-LS2.B	Cause and Effect Energy and Matter Systems and System Models	RST.6-8.3 RST.6-8.7 WHST.6-8.9 6.RP.A.1 6.RP.A.3 MP.2 MP.4

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
parts of an ecosystem.		Investigations			
	From Cells to Organisms: 13	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Planning and Carrying Out Investigations	MS-LS1.C MS-PS3.D	Energy and Matter	RST.6-8.3
MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	*Ecology:* 1, 2, 3, 4, 5, 6, 13, 14*	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	MS-LS2.C	Cause and Effect Connections to the Nature of Science Energy and Matter Patterns Stability and Change Systems and System Models	RST.6-8.1 RST.6-8.3 RST.6-8.8 SL.8.5 WHST.6-8.1 WHST.6-8.9 6.EE.C.9 6.SP.B.5 MP.2
MS-LS2-5: Evaluate competing design	*Ecology:* 2, 4,	Analyzing and Interpreting Data Asking Questions and Defining	MS-ETS1.B MS-LS2.C MS-LS4.D	Cause and Effect Connections to the Nature of	RST.6-8.1 RST.6-8.3 RST.6-8.8

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
solutions for maintaining biodiversity and ecosystem services.	15*	Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations Using Mathematics and Computational Thinking		Science Energy and Matter Patterns Stability and Change	SL.8.5 WHST.6-8.1 WHST.6-8.9 6.SP.B.5
MS-LS3-1: Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure	*Reproduction:* 1, 3, 8, 12, 13*	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Obtaining, Evaluating, and Communicating Information	MS-LS1.B MS-LS3.A MS-LS3.B	Cause and Effect Connections to the Nature of Science Patterns Scale, Proportion, and Quantity Structure and Function	RST.6-8.1 RST.6-8.2 RST.6-8.4 RST.6-8.7 SL.8.1 WHST.6-8.2 WHST.6-8.9 6.SP.B.5 6.RP.A.1

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
and function of the organism.		Planning and Carrying Out Investigations			
	Evolution: 3, 4, 5*	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Using Mathematics and Computational Thinking	MS-LS2.A MS-LS3.A MS-LS3.B MS-LS4.B MS-LS4.C	Cause and Effect Patterns Structure and Function	RST.6-8.2 RST.6-8.3 SL.8.1 SL.8.4 WHST.6-8.2 WHST.6-8.9 6.SP.B.5 6.RP.A.1
MS-LS3-2: Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.	*Reproduction:* 1, 2, 3, 4, 5, 6, 8, 9*	Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	MS-LS1.B MS-LS3.A MS-LS3.B	Cause and Effect Connections to the Nature of Science Patterns Scale, Proportion, and Quantity Structure and Function	RST.6-8.1 RST.6-8.2 RST.6-8.4 RST.6-8.7 RST.6-8.9 SL.8.1 WHST.6-8.2 WHST.6-8.9 6.RP.A.1 6.SP.B.5

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Using Mathematics and Computational Thinking			
MS-LS4-1: Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.	*Evolution: 7, 8, 9, 10 11**	Analyzing and Interpreting Data Connections to the Nature of Science Constructing Explanations and Designing Solutions Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	MS-ESS1.C MS-LS3.B MS-LS4.A MS-LS4.B MS-LS4.C	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Patterns	RST.6-8.3 RST.6-8.7 RST.6-8.9 WHST.6-8.2 6.SP.B.5
MS-LS4-2: Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.	*Evolution:* 7, 8, 9, 10 11, 12*	Analyzing and Interpreting Data Connections to the Nature of Science Constructing Explanations and Designing Solutions Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	MS-ESS1.C MS-LS3.B MS-LS4.A MS-LS4.B MS-LS4.C	Cause and Effect Connections to Engineering, Technology, and Applications of Science Connections to the Nature of Science Patterns	RST.6-8.3 RST.6-8.7 RST.6-8.9 WHST.6-8.2 6.SP.B.5
MS-LS4-3: Analyze displays of pictorial data to compare patterns of similarities	*Evolution:* 12, 13*	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions	MS-ESS1.C MS-LS4.A	Connections to the Nature of Science Patterns	RST.6-8.7 6.SP.B.5

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.		Engaging in Argument from Evidence			
MS-LS4-4: Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	*Evolution:* 1, 2, 3, 4*	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Using Mathematics and Computational Thinking	MS-LS2.A MS-LS3.B MS-LS4.B MS-LS4.C	Cause and Effect Patterns	RST.6-8.2 RST.6-8.3 WHST.6-8.2 WHST.6-8.9 6.RP.A.1 6.SP.B.5
MS-LS4-5: Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.	*Evolution:* 14, 15, 16*	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	MS-ESS3.C MS-LS4.A MS-LS4.B MS-LS4.C MS-LS4.D	Cause and Effect Connections to the Nature of Science: Science Addresses Questions About the Natural and Material World Connections to the Nature of Science: Scientific Knowledge Assumes an Order and Consistency in Natural Systems Patterns	RST.6-8.1 RST.6-8.7 WHST.6-8.2 WHST.6-8.8 WHST.6-8.9
MS-LS4-6: Use	*Evolution:* 1, 2, 3, 4, 5, 6*	Analyzing and Interpreting Data	MS-LS2.A MS-LS3.A	Cause and Effect Patterns	RST.6-8.2 RST.6-8.3

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.		Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Using Mathematics and Computational Thinking	MS-LS3.B MS-LS4.B MS-LS4.C	Structure and Function	SL.8.1 SL.8.4 WHST.6-8.2 WHST.6-8.9 6.RP.A.1 6.SP.B.5
MS-PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.	*Chemistry of Materials:* 2, 6, 7, 12*	Analyzing and Interpreting Data Developing and Using Models Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	MS-PS1.A MS-PS1.B	Connections to Engineering, Technology, and Applications of Science Scale, Proportion, and Quantity Structure and Function	RST.6-8.2 RST.6-8.3 RST.6-8.7
MS-PS1-2: Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	*Chemical Reactions:* 1, 2, 3, 4, 5*	Analyzing and Interpreting Data Connections to the Nature of Science Developing and Using Models Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	MS-PS1.A MS-PS1.B	Patterns Scale, Proportion, and Quantity Structure and Function	RST.6-8.1 RST.6-8.3 RST.6-8.4 RST.6-8.7 RST.6-8.9 SL.8.1 WHST.6-8.9

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
	Chemistry of Materials: 4	Analyzing and Interpreting Data Planning and Carrying Out Investigations Using Mathematics and Computational Thinking	MS-PS1.A	Scale, Proportion, and Quantity Structure and Function	7.RP.A.2
MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	*Chemistry of Materials:* 1, 2, 3, 4, 5, 11, 12, 13*	Analyzing and Interpreting Data Asking Questions and Defining Problems Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations Using Mathematics and Computational Thinking	MS-PS1.A MS-PS1.B	Connections to Engineering, Technology, and Applications of Science Scale, Proportion, and Quantity Structure and Function	RST.6-8.3 RST.6-8.7 WHST.6-8.1 WHST.6-8.9 7.RP.A.2
MS-PS1-4: 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.	*Chemistry of Materials:* 8, 9, 10*	Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Planning and Carrying Out Investigations	MS-PS1.A MS-PS3.A	Cause and Effect	RST.6-8.3

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
MS-PS1-5: Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.	*Chemical Reactions:* 1, 2, 3, 4, 5, 6, 7*	Analyzing and Interpreting Data Connections to the Nature of Science Developing and Using Models Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	MS-PS1.A MS-PS1.B	Energy and Matter Patterns Scale, Proportion, and Quantity Structure and Function Systems and System Models	RST.6-8.1 RST.6-8.3 RST.6-8.4 RST.6-8.7 RST.6-8.9 SL.8.1 WHST.6-8.9
MS-PS1-6: Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.	*Chemical Reactions:* 2, 3, 5, 8, 9, 10, 11*	Analyzing and Interpreting Data Connections to the Nature of Science Constructing Explanations and Designing Solutions Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	MS-ETS1.B MS-ETS1.C MS-PS1.A MS-PS1.B MS-PS3.A	Energy and Matter Patterns	RST.6-8.1 RST.6-8.3 RST.6-8.4 RST.6-8.7 SL.8.1 WHST.6-8.9
MS-PS2-1: Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.	*Force and Motion:* 1, 10, 11, 12*	Asking Questions and Defining Problems Constructing Explanations and Designing Solutions Developing and Using Models Obtaining, Evaluating, and	MS-ETS1.A MS-PS2.A MS.PS3.A MS-PS3.C	Cause and Effect Connections to Engineering, Technology, and Applications of Science Systems and System Models	RST.6-8.1 RST.6-8.3 RST.6-8.7 MP.2

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Communicating Information			
MS-PS2-2: Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	*Force and Motion:* 1, 6, 7, 8, 9, 13*	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations Using Mathematics and Computational Thinking	MS-ETS1.A MS-PS2.A MS.PS3.A MS-PS3.C	Cause and Effect Connections to Engineering, Technology, and Applications of Science Scale, Proportional, and Quantity Stability and Change	RST.6-8.1 RST.6-8.2 RST.6-8.3 RST.6-8.7 6.RP.AP.2 6. SP.B.5 7. EE.B.4 7.RP.A.2 MP.2
MS-PS2-3: Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.	*Fields and Interactions:* 7, 8, 9, 12, 13*, 14	Asking Questions and Defining Problems Developing and Using Models Engaging in Argument from Evidence Connections to the Nature of Science	MS-PS2.B MS-ETS1.B	Cause and Effect Patterns Systems and System Models	RST.6-8.1 RST.6-8.3 WHST.6-8.7 MP.2

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Planning and Carrying Out Investigations			
MS-PS2-4: Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.	*Fields and Interactions:* 3, 4, 7*	Analyzing and Interpreting Data Asking Questions and Defining Problems Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence	MS-PS2.B MS-PS3.A MS-PS3.C MS-ETS1.A MS-ETS1.B	Connections to Nature of Science Patterns Systems and System Models	RST.6.8.1 WHST.6-8.1 SL.8.5 6.EE.C.9 MP.2
MS-PS2-5: Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.	*Fields and Interactions:* 5, 7, 9, 10, 12*	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Planning and Carrying Out Investigations	MS-PS2.B MS-PS3.A MS-PS3.C MS-ETS1.B	Cause and Effect Patterns Systems and System Models	RST.6-8.3 WHST.6-8.1 WHST.6-8.7 MP.2

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
MS-PS3-1: Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.	*Force and Motion: 1, 2, 3, 4, 5**	Analyzing and Interpreting Data Asking Questions and Defining Problems Constructing Explanations and Designing Solutions Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	MS-ETS1.A MS-PS2.A MS.PS3.A MS-PS3.C	Cause and Effect Connections to Engineering, Technology, and Applications of Science Energy and Matter Patterns Scale, Proportion, and Quantity	RST.6-8.7 WHST.6-8.2 6.SP.B.5 7.RP.A.2
MS-PS3-2: Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.	*Fields and Interactions:* 3, 4, 6, 7, 10, 11*	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence	MS-ETS1.A MS-ETS1.B MS-ETS1.C MS-PS2.B MS.PS3.A MS.PS3.C	Cause and Effect Connections to Nature of Science Scale, Proportion, and Quantity Systems and System Models	RST.6-8.1 RST.6-8.3 RST.6-8.7 SL.8.5 WHST.6-8.1 WHST.6-8.7 6.EE.C.9 MP2
	Force and Motion: 1, 3, 4, 5, 10, 14	Asking Questions and Defining Problems Obtaining, Evaluating, and Communicating Information	MS-ETS1.A MS-PS2.A MS-PS3.A MS-PS3.C	Cause and Effect Connections to Engineering, Technology, and Applications of Science	RST.6-8.7

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
MS-PS3-3: Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.	*Energy:* 1, 7, 8, 10, 11, 12, 13*	Analyzing and Interpreting Data Connections to the Nature of Science Constructing Explanations and Designing Solutions Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	MS-ETS1.A MS-ETS1.B MS-PS3.A MS-PS3.B	Cause and Effect Connections to the Nature of Science Energy and Matter Patterns Scale, Proportion, and Quantity Structure and Function Systems and System Models	RST.6-8.1 RST.6-8.3 SL.8.4 WHST.6-8.9 EE.6.A.2 EE.6.C.9 MP.2
MS-PS3-4: Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.	*Energy:* 1, 4, 6, 7, 8*	Analyzing and Interpreting Data Connections to the Nature of Science Constructing Explanations and Designing Solutions Engaging in Argument from Evidence Planning and Carrying Out Investigations	MS-PS3.A MS-PS3.B MS-PS3.C	Cause and Effect Energy and Matter Patterns Scale, Proportion, and Quantity Systems and System Models	RST.6-8.3 WHST.6-8.1 WHST.6-8.9 EE.6.C.9 MP.2
MS-PS3-5: Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from	*Energy:* 2, 3, 4, 5, 6*	Analyzing and Interpreting Data Connections to the Nature of Science Constructing Explanations and Designing Solutions	MS-PS3.A MS-PS3.B MS-PS3.C	Cause and Effect Energy and Matter Patterns Scale, Proportion, and	RST.6-8.3 WHST.6-8.1 WHST.6-8.9 EE.6.C.9 MP.2

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
the object.		Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations		Quantity Systems and System Models	
MS-PS4-1: 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.	*Waves:* 1, 2, 3, 7*	Analyzing and Interpreting Data Developing and Using Models Obtaining, Evaluating, and Communicating Information Using Mathematics and Computational Thinking	MS-PS4.A	Connections to Engineering, Technology, and Applications of Science Patterns Structure and Function	RST.6-8.1 RST.6-8.3 RST.6-8.9 6.RP.A.1 7.RP.A.2 MP.2 MP.4
MS-PS4-2: Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	*Waves:* 3, 4, 8, 9, 10, 11, 12, 13*	Analyzing and Interpreting Data Connections to the Nature of Science Developing and Using Models Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations	MS-PS4.A MS-PS4.B	Connections to Engineering, Technology, and Applications of Science Patterns Structure and Function	RST.6-8.1 RST.6-8.3 RST.6-8.9 MP.2

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Using Mathematics and Computational Thinking			
MS-PS4-3: Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.	*Waves:* 5, 6	Asking Questions and Defining Problems Connections to Engineering, Technology, and Applications of Science Structure and Function Developing and Using Models Obtaining, Evaluating, and Communicating Information	MS-PS4.C MS-ETS1.A MS-ETS1.B MS-ETS1.C	Connections to Engineering, Technology, and Applications of Science Structure and Function	RST.6-8.1 RST.6-8.3 RST.6-8.9 WHST.6-8.9
MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	*Biomedical Engineering:* 1, 2, 3*	Asking Questions and Defining Problems	MS-ETS1.A MS-ETS1.B MS-ETS1.C	Structure and Function Interdependence of Science, Engineering, and Technology Influence of Science, Engineering, and Technology on Society and the Natural World	RST.6-8.1 RST.6-8.2 RST.6-8.9
	Force and Motion: 1, 10, 11, 13, 14, 15*	Analyzing and Interpreting Data Asking Questions and Defining Problems Constructing Explanations and Designing Solutions	MS-ETS1.A MS-PS2.A MS-PS3.A MS-PS3.C	Cause and Effect Connections to Engineering, Technology, and Applications of Science Patterns	RST.6-8.1 RST.6-8.3 RST.6-8.7 MP.2

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Developing and Using Models Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations		Stability and Change Systems and System Models	
	*Fields and Interactions 2, 3, 6**	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to Nature of Science Developing and Using Models Engaging in Argument from Evidence	MS-ETS1.A MS-ETS1.B MS-ETS1.C MS-PS3.A MS-PS2.B	Connections to Nature of Science: Influence of Science, Engineering, and Technology on Society and the Natural World Systems and System Models	RST.6-8.1 RST.6-8.7 SL8.5 MP.2
	Land, Water, and Human Interactions: 7, 12*	Asking Questions and Defining Problems Constructing Explanations and Designing Solutions Developing and Using Models	MS-ETS1.A MS-ETS2.A MS-ETS2.C	Connections to Engineering, Technology, and Applications of Science Energy and Matter Scale, Proportion, and Quantity Stability and Change	RST.6-8.3

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	*Biomedical Engineering:* 4, 5, 7*	Analyzing and Interpreting Data Asking Questions and Defining Problems Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Using Mathematics and Computational Thinking	MS-ETS1.B MS-ETS1.C MS-LS1.A	Connections to Engineering, Technology, and Applications of Science Structure and Function	SL.8.4 6.RP.A.1 6.RP.A.3 MP.2
	Fields and Interactions: 6, 13, 15	Analyzing and Interpreting Data Asking Questions and Defining Problems Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence	MS-PS2.B MS-PS3.A MS-ETS1.A MS-ETS1.B MS-ETS1.C	Cause and Effect Connections to Nature of Science Systems and System Models	RST.6-8.1 RST.6-8.7 SL.8.5 WHST.6-8.9 MP.2
	*Land, Water, and Human Interactions: 12, 16**	Constructing Explanations and Designing Solutions Engaging in Argument from Evidence	MS-ESS2.C MS-ESS3.C MS-ETS1.B	Cause and Effect Connections to Nature of Science	WHST.6-8.2 SL.8.4

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	*Biomedical Engineering: 1, 2, 4, 5**	Analyzing and Interpreting Data Asking Questions and Defining Problems Developing and Using Models Constructing Explanations and Designing Solutions Using Mathematics and Computational Thinking	MS-ETS1.A MS-ETS1.B MS-ETS1.C MS-LS1.A	Connections to Engineering, Technology, and Applications of Science Structure and Function	SL.8.4 6.RP.A.1 6.RP.A.3 MP.2
	Chemical Reactions: 8, 9, 10, 11	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions	MS-ETS1.B MS-ETS1.C MS-PS1.B MS-PS3.A	Energy and Matter	RST.6-8.3
	*Weather and Climate: 12**	Analyzing and Interpreting Data Developing and Using Models Engaging in Argument from Evidence Planning and Carrying Out Investigations	MS-ETS1.B MS-ESS1.C MS-ESS2.C	Connections to Engineering, Technology and Applications of Science Structure and Function	RST.6-8.3 SL.8.1 SL.8.4
	*Fields and Interactions: 6, 11, 13, 15**	Analyzing and Interpreting Data Asking Questions and Defining Problems Constructing Explanations and Designing Solutions	MS-ETS1.A MS-ETS1.B MS-ETS1.C MS-PS3.A MS-PS3.C MS-PS2.B	Cause and Effect Connections to Nature of Science Scale, Proportion, and Quantity	RST.6-8.1 RST.6-8.7 SL8.5 WHST.6-8.9 MP.2

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
		Developing and Using Models Engaging in Argument from Evidence		Systems and System Models	
MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	*Biomedical Engineering:* 2, 4, 5, 8, 9*	Analyzing and Interpreting Data Asking Questions and Defining Problems Connections to the Nature of Science Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence Using Mathematics and Computational Thinking	MS-ETS1.A MS-ETS1.B MS-ETS1.C MS-LS1.A	Connections to Engineering, Technology, and Applications of Science Structure and Function	SL.8.4 6.RP.A.1 6.RP.A.3 MP.2
	Chemical Reactions: 8, 9, 10, 11	Analyzing and Interpreting Data Constructing Explanations and Designing Solutions	MS-PS1.B MS-PS3.A MS-ETS1.B MS-ETS1.C	Energy and Matter	RST.6-8.3
	Weather and Climate: 12*	Developing and Using Models Engaging in Argument from Evidence Planning and Conducting Investigations	MS-ETS1.B MS-ESS1.C MS-ESS2.C	Connections to Engineering, Technology and Applications of Science Structure and Function	RST.6-8.3 SL.8.1 SL.8.4

Performance Expectation	SEPUP Unit and Activity Number	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Common Core ELA/Math
	Fields and Interactions: 1, 2, 3, 6, 11, 13*	Asking Questions and Defining Problems Analyzing and Interpreting Data Connections to Nature of Science: Scientific Knowledge Is Based on Empirical Evidence Constructing Explanations and Designing Solutions Developing and Using Models Engaging in Argument from Evidence	MS-ETS1.A MS-ETS1.B MS-ETS1.C MS-PS2.B MS-PS3.A MS-PS3.B MS-PS3.C	Cause and Effect Connections to Nature of Science: Influence of Science, Engineering, and Technology on Society and the Natural World Scale, Proportion, and Quantity Systems and System Models	RST.6-8.1 RST.6-8.7 SL8.5 MP.2