A Correlation of

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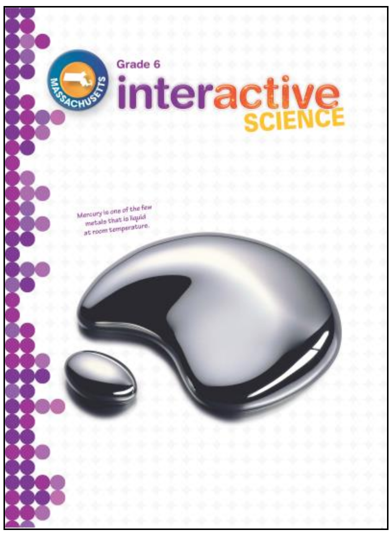

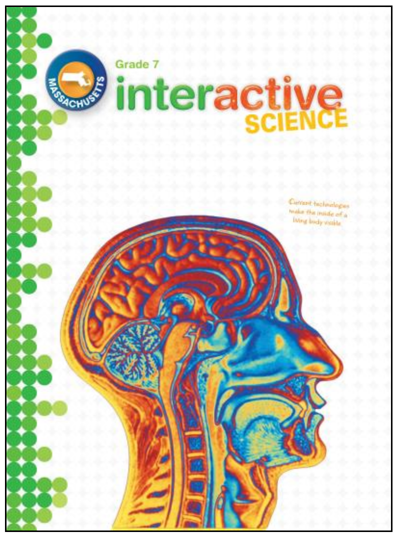

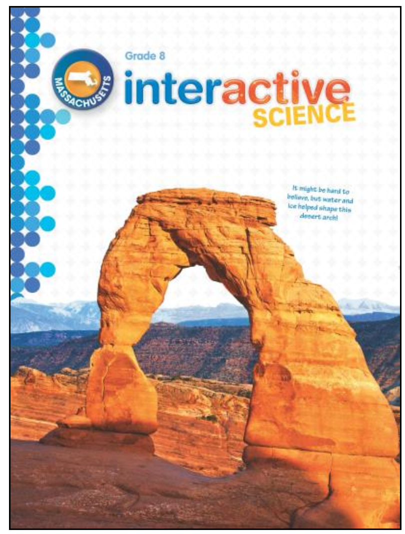

to the

Massachusetts
Science and Technology/Engineering
Learning Standards

Grades 6-8

Pearson

Table of Contents

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Introduction

The following document demonstrates how the ***Massachusetts Interactive Science* ©2017** program supports the **2016 Massachusetts Science and Technology/Engineering Learning Standards** for Grades 6-8. Correlation references are to the Student and Teacher Editions and online Quest/STEMQuest and laboratory activities.

Massachusetts Interactive Science is a middle school science program composed of three texts addressing life, earth, and physical science topics that makes learning personal, engaging, and relevant for today's student. ***Interactive Science*** features an innovative Write-in Student Edition that enables students to become active participants in their learning and truly connect the Big Ideas of science to their world.

Online ***Quests*** and ***STEMQuests*** are problem-based learning activities designed to allow students to solve real world topics at each grade level using hands-on, investigative, and collaborative skills. A focus on science and engineering practices requires students to apply what they have learned to new situations and new content.

Additional STEM activities embedded throughout the program enable students to interact with science and engineering practices and cross-cutting concepts in order to promote higher-order, critical-thinking skills that result in improved performance.

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 6
GRADE 6	
Structure and Function The integration of Earth and space, life, and physical sciences with technology/engineering gives grade 6 students relevant and engaging opportunities with natural phenomena and design problems that highlight the relationship of structure and function in the world around them. Students relate structure and function through analyzing the macro and microscopic world, such as Earth features and process, the role of cells and anatomy in supporting living organisms, and properties of materials and waves. Students use models and provide evidence to make claims and explanations about structure-function relationships in different science and technology/engineering domains.	
Earth and Space Sciences	
ESS1. Earth's Place in the Universe	
6.MS-ESS1-1a. Develop and use a model of the Earth-sun-moon system to explain the causes of lunar phases and eclipses of the sun and moon. *Clarification Statement:* • Examples of models can be physical, graphical, or conceptual and should emphasize relative positions and distances.	**SE/TE:** 20–22, What Causes the Moon's Phases? 23–25, What are Eclipses? **TE Only:** 20A, Professional Development Note: Content Refresher 21, ELL Support 22, 21st Century Learning 23, Differentiated Instruction 24, Professional Development Note 25, Differentiated Instruction 37A, Performance Expectation Activity **Online:** Inquiry Warm-Up: How Does the Moon Move? Quick Lab: Moon Phases Quick Lab: Eclipses

Science and Technology / Engineering Learning Standards	**Massachusetts Interactive Science ©2017 Grade 6**
6.MS-ESS1-4. Analyze and interpret rock layers and index fossils to determine the relative ages of rock formations that result from processes occurring over long periods of time. *Clarification Statements:* • Analysis includes Laws of Superposition and Crosscutting Relationships limited to minor displacement faults that offset layers. • Processes that occur over long periods of time include changes in rock types through weathering, erosion, heat, and pressure. *State Assessment Boundary:* • Strata sequences that have been reordered or overturned, names of specific periods or epochs and events within them, or the identification and naming of minerals or rock types are not expected in state assessment.	**SE/TE:** 50–53, How Old Are Rock Layers? 54–55, How Can Rock Layers Change? 63, Dividing Geologic Time **TE Only:** 50A, Professional Development Note: Content Refresher 53, Differentiated Instruction 55, Differentiated Instruction 85A, Performance Expectation Activity **Online:** Inquiry Warm-Up: Which Layer is the Oldest? Lab Investigation: Exploring Geologic Time Through Core Samples
6.MS-ESS1-5(MA). Use graphical displays to illustrate that Earth and its solar system are one of many in of the Milky Way galaxy, which is one of billions of galaxies in the universe. *Clarification Statement:* • Graphical displays can include maps, charts, graphs, and data tables.	**SE/TE:** 30–31, What Are the Major Types of Galaxies? 31, Apply It! **TE Only:** 29, Differentiated Instruction 30, 21st Century Learning 31, Differentiated Instruction 37B, Performance Expectation Activity

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 6
ESS2. Earth's Systems	
6.MS-ESS2-3. Analyze and interpret maps showing the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence that Earth's plates have moved great distances, collided, and spread apart. *Clarification Statement:* • Maps may show similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches) similar to Wegener's visuals. *State Assessment Boundary:* • Mechanisms for plate motion or paleomagnetic anomalies in oceanic and continental crust are not expected in state assessment.	**SE/TE:** 90–91, Scenario Investigation: Flight 7084 to Barcelona 90–95, What Was Wegener's Hypothesis About the Continents? 92, My Planet Diary: A Puzzled Look 96, My Planet Diary: Marie Tharp 96–97, What Are Mid-Ocean Ridges? 98–99, What Is Sea-Floor Spreading? 100–101, What Happens at Deep-Ocean Trenches? 102, My Planet Diary: Slip-Sliding Away 102–106, What Is the Theory of Plate Tectonics? 106–107, Explore the Big Question: Earth's Changing Crust **TE Only:** 92A, Professional Development Note: Content Refresher 93, 21st Century Learning 94, Build Inquiry: Make Models of Continents Materials 95, 99, 101, Differentiated Instruction 99, 21st Century Learning 99, Differentiated Instruction 101, Differentiated Instruction 104, Professional Development Note 105, Teacher Demo: Make a Model of Plates 113A, Performance Expectation Activity **Online:** Inquiry Warm-Up: How Are Earth's Continents Linked Together? Quick Lab: Moving the Continents Quick Lab: Mid-Ocean Ridges Inquiry Warm-Up: Plate Interactions

Science and Technology / Engineering Learning Standards	**Massachusetts Interactive Science ©2017 Grade 6**
Life Science	
LS1. From Molecules to Organisms: Structures and Processes	
6.MS-LS1-1. Provide evidence that all organisms (unicellular and multicellular) are made of cells. *Clarification Statement:* • Evidence can be drawn from multiple types of organisms, such as plants, animals, and bacteria.	**SE/TE:** 118–119, Scenario Investigation: Mom's Car Must Be Alive 121–123, What Are the Characteristics of All Living Things? 138–141, How Are Organisms Classified Into Domains and Kingdoms? 152, The Big Question: What are cells made of? 156–157, Scenario Investigation: The Cell Game 158–159, What Are Cells? 160–161, What Is the Cell Theory? 174–175, How Do Cells Work Together in an Organism? **TE Only:** 129, 141, 153, 161, Differentiated Instruction 141, 161, Differentiated Instruction 151A, 193A, Performance Expectation Activity 153, Differentiated Instruction 161, Differentiated Instruction **Online:** Quick Lab: Comparing Cells Quick Lab: Observing Cells

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 6
6.MS-LS1-2. Develop and use a model to describe how parts of cells contribute to the cellular functions of obtaining food, water, and other nutrients from its environment, disposing of wastes, and providing energy for cellular processes. *Clarification Statement:* • Parts of plant and animal cells include (a) the nucleus which contains a cell's genetic material and regulates its activities, (b) chloroplasts which produce necessary food (sugar) and oxygen through photosynthesis (in plants), (c) mitochondria which release energy from food through cellular respiration, (d) vacuoles which store materials, including water, nutrients, and waste, (e) the cell membrane which is a selective barrier that enables nutrients to enter the cell and wastes to be expelled, and (f) the cell wall which provides structural support (in plants). *State Assessment Boundary:* • Specific biochemical steps or chemical processes, the role of ATP, active transport processes involving the cell membrane, or identifying or comparing different types of cells are not expected in state assessment.	**SE/TE:** 167–169, How Do the Parts of a Cell Work? 170–173, Explore the Big Question: Cells in Living Things 172, Apply It! 174–175, How Do Cells Work Together in an Organism? 178–181, What Compounds Do Cells Need? 182–187, How Do Materials Move Into and Out of Cells? **TE Only:** 169, 21st Century Learning 169, Differentiated Instruction 170, 21st Century Learning 171, Differentiated Instruction 172, 21st Century Learning 173, Differentiated Instruction 179, 21st Century Learning 193B, Performance Expectation Activity **Online:** Quick Lab: Gelatin Cell Model

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 6
6.MS-LS1-3. Construct an argument supported by evidence that the body systems interact to carry out essential functions of life. *Clarification Statements:* • Emphasis is on the functions and interactions of the body systems, not specific body parts or organs. • An argument should convey that different types of cells can join together to form specialized tissues, which in turn may form organs which work together as body systems. • Body systems to be included are the circulatory, digestive, respiratory, excretory, muscular/skeletal, and nervous systems. • Essential functions of life include obtaining food and other nutrients (water, oxygen, minerals); releasing energy from food; removing wastes; responding to stimuli; maintaining internal conditions; and, growing/developing. • An example of interacting systems could include the respiratory system taking in oxygen from the environment which the circulatory system delivers to cells for cellular respiration, or the digestive system taking in nutrients which the circulatory system transports to cells around the body. *State Assessment Boundaries:* • The mechanism of one body system independent of others or the biochemical processes involved in body systems are not expected in state assessment. • Describing the function or comparing different types of cells, tissues, or organs are not expected in state assessment.	**SE/TE:** 198–199, Scenario Investigation: Working Together Is the Key 200–205, How Is Your Body Organized? 207–211, How Do You Move? 212–213, Which Systems Control Body Functions? 215–219, How Does Your Body Stay in Balance? 220–221, Explore the Big Question: Systems in Action **TE Only:** 202, 21st Century Learning 203, Differentiated Instruction 204, 21st Century Learning 205, Teacher Demo: All Systems Go 209, Differentiated Instruction 211, Differentiated Instruction 211, Teacher Demo: Mechanical Digestion 213, Differentiated Instruction 217, Differentiated Instruction 218, Teacher Demo: Getting Stressed 219, Differentiated Instruction 245A, Performance Expectation Activity **Online:** Inquiry Warm-Up: How Is Your Body Organized? Quick Lab: Observing Cells and Tissues Inquiry Warm-Up: How Does Your Body Respond? Quick Lab: Working Together, Act I Quick Lab: Working Together, Act II STEM Quest: Heart Beat, Health Beat

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 6
LS4. Biological Evolution: Unity and Diversity	
6.MS-LS4-1. Analyze and interpret evidence from the fossil record to describe organisms and their environment, extinctions, and changes to life forms throughout the history of Earth. *Clarification Statement:* • Examples of evidence include sets of fossils that indicate a specific type of environment, anatomical structures that indicate the function of an organism in the environment, and fossilized tracks that indicate behavior of organisms. *State Assessment Boundary:* • Names of individual species, geological eras in the fossil record, or mechanisms for extinction or speciation are not expected in state assessment.	**SE/TE:** 69–72, What Happened in the Paleozoic Era? 73–74, What Happened in the Mesozoic Era? 75, What Happened in the Cenozoic Era? 76–79, Explore the Big Question: Geologic History 84, Science Matters: Putting the Puzzle Together **TE Only:** 69, 21st Century Learning 71, Differentiated Instruction 72, 21st Century Learning 77, Build Inquiry: Prehistoric Life Forms 79, Differentiated Instruction 85B, Performance Expectation Activity **Online:** Quick Lab: Graphing the Fossil Record Quick Lab: Modeling Asteroid Impact Quick Lab: Cenozoic Timeline
6.MS-LS4-2. Construct an argument using anatomical structures to support evolutionary relationships among and between fossil organisms and modern organisms. *Clarification Statement:* • Evolutionary relationships include (a) some organisms have similar traits with similar functions because they were inherited from a common ancestor, (b) some organisms have similar traits that serve similar functions because they live in similar environments, and (c) some organisms have traits inherited from common ancestors that no longer serve their original function because their environments are different than their ancestors' environments.	**SE/TE:** 45, What Are Fossils? 46–47, What Are the Kinds of Fossils? 48–49, What Do Fossils Show? **TE Only:** 46, Teacher Demo: Model Petrified Fossils 48, 21st Century Learning 49, Differentiated Instruction 85C, Performance Expectation Activity **Online:** Quick Lab: Sweet Fossils Quick Lab: Modeling Trace Fossils Quick Lab: Modeling the Fossil Record

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 6
Physical Science	
PS1. Matter and Its Interactions	
6.MS-PS1-6. Plan and conduct an experiment involving exothermic and endothermic chemical reactions to measure and describe the release or absorption of thermal energy. *Clarification Statements:* • Emphasis is on describing transfer of energy to and from the environment. • Examples of chemical reactions could include dissolving ammonium chloride or calcium chloride.	**SE/TE:** 248, Vocabulary Skill 276–277, How Are Changes in Energy and Matter Related? 277, Do the Math! **TE Only:** 277, 21st Century Learning 277, Differentiated Instruction 285A, Performance Expectation Activity **Online:** Quick Lab: Where Was the Energy? STEM Quest: Energy Salts
6.MS-PS1-7(MA). Use a particulate model of matter to explain that density is the amount of matter (mass) in a given volume. Apply proportional reasoning to describe, calculate, and compare relative densities of different materials.	**SE/TE:** 265–267, What Units Are Used to Express Mass and Volume? 268–269, How Is Density Determined? **TE Only:** 266, 21st Century Learning 267, Build Inquiry: Volume of a Rectangular Solid 267, Differentiated Instruction 269, Differentiated Instruction 269, Build Inquiry: A Density “Eggsperiment” 285B, Performance Expectation Activity **Online:** Inquiry Warm-Up: Which Has More Mass? Quick Lab: Calculating Volume Lab Investigation: Making Sense of Density

Science and Technology / Engineering Learning Standards	**Massachusetts Interactive Science ©2017 Grade 6**
6.MS-PS1-8(MA). Conduct an experiment to show that many materials are mixtures of pure substances that can be separated by physical means into their component pure substances. *Clarification Statement:* • Examples of common mixtures include salt water, oil and vinegar, milk, and air.	**SE/TE:** 259–261, What Is Matter Made Of? 262–263, What Are Two Types of Mixtures? **TE Only:** 259, Build Inquiry: Elements Everywhere 260, 21st Century Learning 261, Differentiated Instruction 263, Build Inquiry: Getting the Iron Out 285C, Performance Expectation Activity **Online:** Quick Lab: Separating Mixtures
PS2. Motion and Stability: Forces and Interactions	
6.MS-PS2-4. Use evidence to support the claim that gravitational forces between objects are attractive and are only noticeable when one or both of the objects have a very large mass. *Clarification Statement:* • Examples of objects with very large masses include the Earth, Sun, and other planets. *State Assessment Boundary:* • Newton's Law of Gravitation or Kepler's Laws are not expected in state assessment.	**SE/TE:** 10–11, What Determines Gravity? 12, What Keeps Objects in Orbit? **TE Only:** 37C, Performance Expectation Activity **Online:** Inquiry Warm-Up: What Factors Affect Gravity? Quick Lab: What's Doing the Pulling?

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 6
PS4. Waves and Their Applications in Technologies for Information Transfer	
6.MS-PS4-1. Use diagrams of a simple wave to explain that (a) a wave has a repeating pattern with a specific amplitude, frequency, and wavelength, and (b) the amplitude of a wave is related to the energy of the wave. *State Assessment Boundaries:* • Electromagnetic waves are not expected in state assessment. • State assessment will be limited to standard repeating waves.	**SE/TE:** 298, My Planet Diary: The Sound of Romance 299–301, What Are the Amplitude, Wavelength, Frequency, and Speed of a Wave? 302, How Are Frequency, Wavelength, and Speed Related? 303, The Big Question: Ride the Waves 303, Assess Your Understanding **TE Only:** 301, 21st Century Learning 301, Teacher Demo: Speed of a Wave 301, Differentiated Instruction 303, Differentiated Instruction 317A, Performance Expectation Activity **Online:** Inquiry Warm-Up: What Do Waves Look Like? Quick Lab: Properties of Waves Quick Lab: What Affects the Speed of a Wave?
6.MS-PS4-2. Use diagrams and other models to show that both light rays and mechanical waves are reflected, absorbed, or transmitted through various materials. *Clarification Statements:* • Materials may include solids, liquids, and gases. • Mechanical waves (including sound) need a material (medium) through which they are transmitted. • Examples of models could include drawings, simulations, and written descriptions. *State Assessment Boundary:* • State assessment will be limited to qualitative applications.	**SE/TE:** 305–307, What Changes the Direction of a Wave? 307, Apply It! 308–309, What Are the Two Types of Wave Interference? 310–311, How Do Standing Waves Form? 350–351, The Big Question 354–357, STEM Activity: Optical Security 358–361, What Determines Color? 361, Apply It! 364–365, What Are the Kinds of Reflection? 366–368, What Types of Images to Mirrors Produce? 370, My Planet Diary: Isaac Newton 371–374, What Causes Light Rays to Bend? 375–376, What Determines the Type of Image Formed by a Lens? 377, Apply It!

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 6
(continued) **6.MS-PS4-2.** Use diagrams and other models to show that both light rays and mechanical waves are reflected, absorbed, or transmitted through various materials. *Clarification Statements:* • Materials may include solids, liquids, and gases. • Mechanical waves (including sound) need a material (medium) through which they are transmitted. • Examples of models could include drawings, simulations, and written descriptions. *State Assessment Boundary:* • State assessment will be limited to qualitative applications.	**TE Only:** 305, Build Inquiry: Reflecting Light Around a Barrier 306, 21st Century Learning 307, Differentiated Instruction 311, Teacher Demo: Observe Resonance 351, Differentiated Instruction 354, Professional Development Note 360, Teacher Demo: Light Reflected By Opaque Materials 361, Teacher Demo: Color of Transmitted Light 365, 21st Century Learning 366, 21st Century Learning 367, Teacher Demo: Model Reflection From a Concave Mirror 367, Differentiated Instruction 367, Build Inquiry: Find the Focal Point 369, Differentiated Instruction 371, Teacher Demonstration: See the Penny 372, 21st Century Learning 373, Differentiated Instruction 375, Differentiated Instruction 391A, Performance Expectation Activity **Online:** Lab Investigation: Making Waves Quick Lab: Wave Interference Quick Lab: Standing Waves Quick Lab: Developing Hypotheses Lab Investigation: Changing Colors Inquiry Warm-Up: How Does Your Reflection Wink? Quick Lab: Observing Quick Lab: Mirror Images Inquiry Warm-Up: Can You Make an Image Appear? STEM Quest: Make Light Go Where You Want It

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 6
6.MS-PS4-3. Present qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses representing 0s and 1s) can be used to encode and transmit information. *State Assessment Boundary:* • Binary counting or the specific mechanism of any given device are not expected in state assessment.	**SE/TE:** 337–339, How Do Radio Waves Transmit Information? 340–341, How Does a Cell Phone Work? 342–343, How Does Satellite Communication Work? **TE Only:** 339, Differentiated Instruction 340, Teacher Demo: Model Cell Phone Transmissions 349A, Performance Expectation Activity **Online:** Quick Lab: How Cell Phones Work Quick Lab: How Does GPS Work?
Technology/Engineering	
ETS1. Engineering Design	
6.MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. Include potential impacts on people and the natural environment that may limit possible solutions.*	**SE/TE:** 396–397, Scenario Investigation: That Isn't Science! 432–435, STEM Activity: Out of the Corner of Your Eye 480, Science Matters: Bakelite®: Molding the Future **TE Only:** 427A, 481A, Performance Expectation Activity **Online:** STEM Quest: Design an Animal Crossing

Science and Technology / Engineering Learning Standards	**Massachusetts Interactive Science ©2017 Grade 6**
6.MS-ETS1-5(MA). Create visual representations of solutions to a design problem. Accurately interpret and apply scale and proportion to visual representations.* *Clarification Statements:* • Examples of visual representations can include sketches, scaled drawings, and orthographic projections. • Examples of scale can include ¼" = 1'0" and 1 cm = 1 m.	**SE/TE:** 461, Why Do Scientists Use Models? 468–469, Explore the Big Question: Out in Space **TE Only:** 427B, 481B, Performance Expectation Activity 469, Differentiated Instruction 469, 21st Century Learning **Online:** STEM Quest: Design an Animal Crossing
6.MS-ETS1-6(MA). Communicate a design solution to an intended user, including design features and limitations of the solution. *Clarification Statement:* • Examples of intended users can include students, parents, teachers, manufacturing personnel, engineers, and customers.	**SE/TE:** 7, STEM Activity: Life on Mars 355, STEM Activity: Optical Security 397, Scenario Investigation: That Isn't Science! 434, STEM Activity: Out of the Corner of Your Eye **TE Only:** 427C, 481C, Performance Expectation Activity
ETS2. Materials, Tools, and Manufacturing	
6.MS-ETS2-1(MA). Analyze and compare properties of metals, plastics, wood, and ceramics, including flexibility, ductility, hardness, thermal conductivity, electrical conductivity, and melting point.	**SE/TE:** 251, STEM Activity: Crystal Clear 433, STEM Activity: Out of the Corner of Your Eye **TE Only:** 427D, 481D, Performance Expectation Activity

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 6
6.MS-ETS2-2(MA). Given a design task, select appropriate materials based on specific properties needed in the construction of a solution. *Clarification Statement:* • Examples of materials can include metals, plastics, wood, and ceramics.	**SE/TE:** 251, STEM Activity: Crystal Clear 433, STEM Activity: Out of the Corner of Your Eye **TE Only:** 427E, 481E, Performance Expectation Activity **Online:** STEM Quest: Keep the Cold Out STEM Quest: Keep the Heat In
6.MS-ETS2-3(MA). Choose and safely use appropriate measuring tools, hand tools, fasteners, and common hand-held power tools used to construct a prototype.* *Clarification Statements:* • Examples of measuring tools include a tape measure, a meter stick, and a ruler. • Examples of hand tools include a hammer, a screwdriver, a wrench, and pliers. • Examples of fasteners include nails, screws, nuts and bolts, staples, glue, and tape. • Examples of common power tools include jigsaw, drill, and sander.	**SE/TE:** 438, Length; Measuring Length 470–474, Why Prepare for a Scientific Investigation? **TE Only:** 427F, 481F, Performance Expectation Activity

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
GRADE 7	
Systems and Cycles Students in grade 7 focus on systems and cycles using their understanding of structures and functions, connections and relationships in systems, and flow of matter and energy developed in earlier grades. A focus on systems requires students to apply concepts and skills across disciplines, since most natural and designed systems and cycles are complex and interactive. They gain experience with plate tectonics, interactions of humans and Earth processes, organism systems to support and propagate life, ecosystem dynamics, motion and energy systems, and key technological systems used by society. Through grade 7, students begin a process of moving from a more concrete to an abstract perspective, since many of the systems and cycles studied are not directly observable or experienced. This also creates a foundation for exploring cause and effect relationships in more depth in grade 8.	
Earth and Space Sciences	
ESS2. Earth's Systems	
7.MS-ESS2-2. Construct an explanation based on evidence for how Earth's surface has changed over scales that range from local to global in size. *Clarification Statements:* • Examples of processes occurring over large, global spatial scales include plate motion, formation of mountains and ocean basins, and ice ages. • Examples of changes occurring over small, local spatial scales include earthquakes and seasonal weathering and erosion.	**SE/TE:** 8–13, What Breaks Down Rocks? 14–15, How Fast Does Weathering Occur? 21, Explore the Big Question: From Rock to Soil 40–41, How Does Stress Change Earth's Crust? 42–43, How Do Faults Form? 44–47, How Does Plate Movement Create New Landforms? 174–175, How Do Waves Affect the Shore? **TE Only:** 10, Professional Development Note 11, Teacher Demo: Mechanical Weathering 11, Differentiated Instruction 11, 21st Century Learning 13, Differentiated Instruction 13, Teach Demo: Chemical Weathering 31A, 67A, Performance Expectation Activity 45, Teacher Demo: Modeling Synclines and Anticlines 45, 21st Century Learning 46, 21st Century Learning 47, Differentiated Instruction 47, 21st Century Learning

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
(continued) **7.MS-ESS2-2.** Construct an explanation based on evidence for how Earth's surface has changed over scales that range from local to global in size. *Clarification Statements:* • Examples of processes occurring over large, global spatial scales include plate motion, formation of mountains and ocean basins, and ice ages. • Examples of changes occurring over small, local spatial scales include earthquakes and seasonal weathering and erosion.	**Online:** Inquiry Warm-Up: How Fast Can It Fizz? Quick Lab: Freezing and Thawing Quick Lab: Rusting Away Quick Lab: It's All On The Surface Inquiry Warm-Up: How Does Stress Affect Earth's Crust?
7.MS-ESS2-4. Develop a model to explain how the energy of the sun and Earth's gravity drive the cycling of water, including changes of state, as it moves through multiple pathways in Earth's hydrosphere. *Clarification Statement:* • Examples of models can be conceptual or physical. *State Assessment Boundary:* • A quantitative understanding of the latent heats of vaporization and fusion is not expected in state assessment.	**SE/TE:** 146–147, What Is the Water Cycle? 149–151, What Is a River System? 152–153, What Are Ponds and Lakes? 154, How Can Lakes Change? 155, Explore the Big Question: An Endless Cycle 157–161, How Does Water Move Underground? **TE Only:** 151, Differentiated Instruction 152, 21st Century Learning 159, Differentiated Instruction 159, 21st Century Learning 161, Lab Resource: Quick Lab: An Artesian Well 161, Differentiated Instruction 181A, Performance Expectation Activity **Online:** Inquiry Warm-Up: Where Does the Water Go?

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
ESS3. Earth and Human Activity	
7.MS-ESS3-2. Obtain and communicate information on how data from past geologic events are analyzed for patterns and used to forecast the location and likelihood of future catastrophic events. *Clarification Statements:* • Geologic events include earthquakes, volcanic eruptions, floods, and landslides. • Examples of data typically analyzed can include the locations, magnitudes, and frequencies of the natural hazards. *State Assessment Boundary:* • Active analysis of data or forecasting is not expected in state assessment.	**SE/TE:** 49–51, What Are Seismic Waves? 52–53, How Are Earthquakes Measured? 54–55, How Is an Epicenter Located? 54, Do the Math! 56, My Planet Diary: Whole Lot of Shaking Going On 57–58, How Do Seismographs Work? 59–60, What Patterns Do Seismographic Data Reveal? 60–61, Explore the Big Question: Earthquakes and Plate Tectonics 74–77, Where Are Volcanoes Found on Earth's Surface? 78–83, What Happens When a Volcano Erupts? 84, What Are the Stages of Volcanic Activity? 85, Explore the Big Question: Mt. Rainier **TE Only:** 50, 21st Century Learning 51, 53, 55, 59, 61, 77, Differentiated Instruction 52, 21st Century Learning 53, Differentiated Instruction 55, Differentiated Instruction 59, Differentiated Instruction 61, Differentiated Instruction 67B, Performance Expectation Activity 76, 21st Century Learning 77, Differentiated Instruction 82, Professional Development Note **Online:** STEM Quest: Patterns in the Cascade Range STEM Quest: Signs of Eruption? Quick Lab: Measuring Earthquakes Lab Investigation: Finding the Epicenter Inquiry Warm-Up: How Can Seismic Waves Be Detected? Quick Lab: Design a Seismograph Quick Lab: Earthquake Patterns

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
7.MS-ESS3-4. Construct an argument supported by evidence that human activities and technologies can mitigate the impact of increases in human population and per capita consumption of natural resources on the environment. Clarification Statements: • Arguments should be based on examining historical data such as population graphs, natural resource distribution maps, and water quality studies over time. • Examples of negative impacts can include changes to the amount and quality of natural resources such as water, mineral, and energy supplies.	**SE/TE:** 98–99, The Big Question 102–103, Scenario Investigation: Light Bulbs Can't Use Much Energy 104, My Planet Diary: Hurricane Energy Crisis 105–110, What Are Three Major Fossil Fuels? 111, Why Are Fossil Fuels Nonrenewable Resources? 112–117, What are Some Renewable Sources of Energy? 118–119, Explore the Big Question: The Energy Around Us 120–121, How Does a Nuclear Power Plant Produce Electricity? 122, My Planet Diary: House of Straw 123, How Has Energy Use Changed Over Time? 124–127, How Can We Ensure There Will Be Enough Energy for the Future? 132, Science Matters: How Low Is Low Impact? 186–189: STEM Activity: It's All Water Under the Dam 190, My Planet Diary: How Do You Feel About Nature? 191–193, What Are the Types of Environmental Issues? 194–195, How Are Environmental Decisions Made? 197–198, What Are Natural Resources? 199–201, Why Are Natural Resources Important? 202–203, How Do People Use Land? 204–207, Why Is Soil Management Important? 226–227, Why Is Fresh Water a Limited Resource? 228–229, What Are the Major Sources of Water Pollution? 230–231, How Can Water Pollution Be Reduced? 232–233, Explore the Big Question: Pollution and Solutions **TE Only:** 106, 21st Century Learning 107, Differentiated Instruction 111, Differentiated Instruction 115, Differentiated Instruction

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
(continued) **7.MS-ESS3-4.** Construct an argument supported by evidence that human activities and technologies can mitigate the impact of increases in human population and per capita consumption of natural resources on the environment. Clarification Statements: • Arguments should be based on examining historical data such as population graphs, natural resource distribution maps, and water quality studies over time. • Examples of negative impacts can include changes to the amount and quality of natural resources such as water, mineral, and energy supplies.	**TE Only:** 115, Differentiated Instruction 117, Differentiated Instruction 117, 21st Century Learning 119, Differentiated Instruction 121, Differentiated Instruction 124, 192, 207, 21st Century Learning 124, Professional Development Note 126, Build Inquiry: Interpret Illustrations 127, Differentiated Instruction 133A, 181B, 239B, Performance Expectation Activity 155, Differentiated Instruction 182, Professional Development Note 192, 21st Century Learning 193, Differentiated Instruction 199, Differentiated Instruction 201, Differentiated Instruction 207, Differentiated Instruction 207, 21st Century Learning 211, Teacher Demo: Make a Model of a Landfill 212, Build Inquiry: What Will Decompose? 213, Build Inquiry: Calculate Trees to Make Newspaper 229, Differentiated Instruction 233, Differentiated Instruction **Online:** STEM Quest: Energy Savings at School Lab Investigation: Fossil Fuels Inquiry Warm-Up: Can You Capture Solar Energy? Quick Lab: Producing Electricity Inquiry Warm-Up: Which Bulb Is More Efficient? Quick Lab: Human Energy Use Quick Lab: Future Energy Use Quick Lab: Water, Water, Everywhere Quick Lab: Environmental Issues Quick Lab: Comparing Costs and Benefits Inquiry Warm-Up: Using Resources Lab Investigation: Recycling Paper Quick Lab: Modeling Soil Conservation Lab Investigation: Waste, Away!

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
Life Science	
LS1. From Molecules to Organisms: Structures and Processes	
7.MS-LS1-4. Construct an explanation based on evidence for how characteristic animal behaviors and specialized plant structures increase the probability of successful reproduction of animals and plants. *Clarification Statements:* • Examples of animal behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalizations and colorful plumage to attract mates for breeding. • Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds; and, creating conditions for seed germination and growth. • Examples of plant structures that affect the probability of plant reproduction could include bright flowers attracting butterflies that transfer pollen, flower nectar, and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury. *State Assessment Boundary:* • Natural selection is not expected in state assessment.	**SE/TE:** 247–251, How Do Animals Reproduce? 252–253, How Do External and Internal Fertilization Differ? 254, My Planet Diary: Beware of Glass 255–256, Where Do Embryos Develop? 257–260, How Do Young Animals Develop? 261–262, How Do Animals Care for Their Young? 263, Do the Math! 264–269, What Are the Functions of Roots, Stems, and Leaves? 270–271, How Do Seeds Become New Plants? 272–273, What Are the Structures of a Flower? 274–275, What Are the Stages of a Plant's Life Cycle? 276–281, How Do Plants Reproduce? **TE Only:** 248, Professional Development Note 250, 21st Century Learning 253, Differentiated Instruction 257, Differentiated Instruction 257, 21st Century Learning 259, Differentiated Instruction 260, 21st Century Learning 261, Differentiated Instruction 268, Professional Development Note 269, 21st Century Learning 271, Lab Zone: Modeling Seed Dispersal 273, Lab Zone: Observing the Structure of a Flower 287A, Performance Expectation Activity **Online:** Quick Lab: To Care or Not to Care Quick Lab: Modeling Flowers

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LS2. Ecosystems: Interactions, Energy, and Dynamics	
7.MS-LS2-1. Analyze and interpret data to provide evidence for the effects of periods of abundant and scarce resources on the growth of organisms and the size of populations in an ecosystem.	**SE/TE:** 295, What Does an Organism Get From Its Environment? 296, What Are the Two Parts of an Organism's Habitat? 297, 307 Apply It! 298–299, How Is an Ecosystem Organized? 300–304, How Do Populations Change in Size? 305–306, What Factors Limit Population Growth? **TE Only:** 295, ELL Support 297, Differentiated Instruction 299, Differentiated Instruction 302, 21st Century Learning 303, Differentiated Instruction 305, Differentiated Instruction 307, Differentiated Instruction 323A, Performance Expectation Activity **Online:** Quick Lab: Growing and Shrinking After Inquiry Warm-Up: Interactions Among Living Things Quick Lab: Adaptations for Survival Quick Lab: Competition and Predation

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
7.MS-LS2-2. Describe how relationships among and between organisms in an ecosystem can be competitive, predatory, parasitic, and mutually beneficial and that these interactions are found across multiple ecosystems. *Clarification Statement:* • Emphasis is on describing consistent patterns of interactions in different ecosystems in terms of relationships among and between organisms.	**SE/TE:** 288–289, The Big Question 308, My Planet Diary: Predator Power 308–310, How Do Adaptations Help an Organism Survive? 311–313, What Are Competition and Predation? 314, Do the Math!: Predator-Prey Interactions 315–316, What Are the Three Types of Symbiosis? 317, Apply It! **TE Only:** 289, Differentiated Instruction 311, Differentiated Instruction 315, Differentiated Instruction 316, 21st Century Learning 317, Differentiated Instruction 323B, Performance Expectation Activity **Online:** Quick Lab: Competition and Predation Quick Lab: Type of Symbiosis Quick Lab: Adaptations for Survival

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
7.MS-LS2-3. Develop a model to describe that matter and energy cycle among living and nonliving parts of an ecosystem and that both matter and energy are conserved through these processes *Clarification Statements:* • Cycling of matter should include the role of photosynthesis, cellular respiration, and decomposition, and transfer among producers, primary, secondary, and tertiary consumers, and decomposers. • Models may include food webs and food chains. *State Assessment Boundary:* • Cycling of specific atoms (such as carbon or oxygen), or the biochemical steps of photosynthesis, cellular respiration, and decomposition are not expected in state assessment.	**SE/TE:** 324–325, The Big Question 333–335, What Are the Energy Roles in an Ecosystem? 336–338, How Does Energy Move Through an Ecosystem? 339, Do the Math! 340–341, How Do Human Activities Affect Ecosystems? 342–343, What Processes Are Involved in the Water Cycle? 344–345, How Are the Carbon and Oxygen Cycles Related? 346–347, How Does Nitrogen Cycle Through Ecosystems? 348–349, Explore the Big Question: Cycles of Matter 374–375, Scenario Investigation: Fantasy Food Chain **TE Only:** 334, 21st Century Learning 335, Differentiated Instruction 337, Differentiated Instruction 339, Differentiated Instruction 340, 21st Century Learning 345, Differentiated Instruction 347, Differentiated Instruction 347, 21st Century Learning 349, Differentiated Instruction 369A, Performance Expectation Activity **Online:** Lab Investigation: Consequences of Human Activity Quick Lab: Following Water Quick Lab: Carbon and Oxygen Blues Quick Lab: Playing Nitrogen Cycle Roles

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
7.MS-LS2-4. Analyze data to provide evidence that disruptions (natural or human-made) to any physical or biological component of an ecosystem can lead to shifts in all its populations. *Clarification Statement:* • Focus should be on ecosystem characteristics varying over time, including disruptions such as hurricanes, floods, wildfires, oil spills, and construction.	**SE/TE:** 370–371, How Might a Bayou Change Over Time? 376–379, How Do Ecosystems Change Over Time? 380–381, How Do Changes in Ecosystems Affect the Survival of Organisms? 385–387, How Do Human Activities Affect Ecosystems? 388, My Planet Diary: Blog 389–390, What Is Biodiversity's Value? 393, What Factors Affect Biodiversity? 394–395, How Do Humans Affect Biodiversity? 396–397, Explore the Big Question: Life in a Coral Reef **TE Only:** 379, Differentiated Instruction 381, Differentiated Instruction 381, 21st Century Learning 385, Differentiated Instruction 386, Differentiated Instruction 387, Differentiated Instruction 391, Differentiated Instruction 393, Differentiated Instruction 395, Differentiated Instruction 395, 21st Century Learning 397, Differentiated Instruction 407A, Performance Expectation Activity **Online:** Quick Lab: How Do Humans Impact Ecosystems? Quick Lab: Adaptations for Survival Inquiry Warm-Up: How Communities Change Inquiry Warm-Up: How Do You Interact With Your Environment? Lab Investigation: Consequences of Human Activity

Science and Technology / Engineering Learning Standards	**Massachusetts Interactive Science ©2017 Grade 7**
7.MS-LS2-5. Evaluate competing design solutions for protecting an ecosystem. Discuss benefits and limitations of each design.* *Clarification Statements:* • Examples of design solutions could include water, land, and species protection, and the prevention of soil erosion. • Examples of design solution constraints could include scientific, economic, and social considerations.	**SE/TE:** 23–24, How Can Soil Lose Its Value? 25, How Can Soil Be Conserved? 31, Science and History: The Plant Doctor 204–207, Why Is Soil Management Important? 209–211, What Are Three Solid Waste Disposal Methods? 209, Apply It! 212–213, What Are the Major Categories of Recycling? 214–215, How Are Hazardous Wastes Safely Disposed Of? 226–227, Why Is Fresh Water a Limited Resource? 228–229, What Are the Major Sources of Water Pollution? 230–231, How Can Water Pollution Be Reduced? 232–233, Explore the Big Question: Pollution and Solutions 238, Science and History: Please Don't Pass the Plastic! 328–331, STEM Activity: River Works 340–341, How Do Human Activities Affect Ecosystems? **TE Only:** 23, ELL Support 25, Differentiated Instruction 25, 21st Century Learning 207, Differentiated Instruction 207, 21st Century Learning 209, ELL Support 213, Differentiated Instruction 229, Differentiated Instruction 231, Differentiated Instruction 239A, Performance Expectation Activity **Online:** Quick Lab: Soil Conservation Quick Lab: Modeling Soil Conservation Quick Lab: Getting Clean

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
7.MS-LS2-6(MA). Explain how changes to the biodiversity of an ecosystem—the variety of species found in the ecosystem—may limit the availability of resources humans use. *Clarification Statement:* • Examples of resources can include food, energy, medicine, and clean water.	**SE/TE:** 380–381, How Do Changes in Ecosystems Affect the Survival of Organisms? 382–384, What Resources Do Humans Obtain From Ecosystems? 385–387, How Do Human Activities Affect Ecosystems? 388–390, What Is Biodiversity's Value 391–393, What Factors Affect Biodiversity? 394–395, How Do Humans Affect Biodiversity? **TE Only:** 383, ELL Support 384, 21st Century Learning 385, Differentiated Instruction 386, Differentiated Instruction 387, 21st Century Learning 387, Differentiated Instruction 397, Differentiated Instruction 407B, Performance Expectation Activity **Online:** Quick Lab: How Do Humans Impact Ecosystems?
Physical Science	
PS2. Motion and Stability: Forces and Interactions	
7.MS-PS2-3. Analyze data to describe the effect of distance and magnitude of electric charge on the strength of electric forces. *Clarification Statement:* • Includes both attractive and repulsive forces. *State Assessment Boundaries:* • State assessment will be limited to proportional reasoning. • Calculations using Coulomb's law or interactions of sub-atomic particles are not expected in state assessment.	**SE/TE:** 511–512, How Do Charges Interact? 513–517, How Does Charge Build Up? 518–520, How Is Electric Current Made? 522–525, What Affects Current Flow? **TE Only:** 511, ELL Support 511, 21st Century Learning 513, Differentiated Instruction 515, 21st Century Learning 515, Differentiated Instruction 519, 21st Century Learning 523, Differentiated Instruction **Online:** Quick Lab: Drawing Conclusions Quick Lab: Sparks Are Flying

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
7.MS-PS2-5. Use scientific evidence to argue that fields exist between objects with mass, between magnetic objects, and between electrically charged objects that exert force on each other even though the objects are not in contact. *Clarification Statement:* • Emphasis is on evidence that demonstrates the existence of fields, limited to gravitational, electric, and magnetic fields. *State Assessment Boundary:* • Calculations of force are not expected in state assessment.	**SE/TE:** 473–475, What Is a Magnetic Field's Shape? 476–477, What Is Earth's Magnetic Field Like? 479–480, How Are Electric Currents and Magnetic Fields Related? 481, What Is a Magnetic Field Produced by a Current Like? 482–483, What Are the Characteristics of Solenoids and Electromagnets? 484–485, How Is Electrical Energy Transformed Into Mechanical Energy? 486–487, How Does a Galvanometer Work? 488–489, What Does an Electric Motor Do? **TE Only:** 473, ELL Support 475, 21st Century Learning 475, Differentiated Instruction 476, Professional Development Note 479, ELL Support 481, Differentiated Instruction 483, Differentiated Instruction 484A, Professional Development Note: Content Refresher 503A, Performance Expectation Activity **Online:** Quick Lab: Earth's Magnetic Field Quick Lab: Magnetic Fields from Electric Current Quick Lab: Electromagnet Quick Lab: Can a Magnet Move a Wire?

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PS3. Energy	
7.MS-PS3-1. Construct and interpret data and graphs to describe the relationships among kinetic energy, mass, and speed of an object. *Clarification Statements:* • Examples could include riding a bicycle at different speeds and rolling different size rocks downhill. • Consider relationships between kinetic energy vs. mass and kinetic energy vs. speed separate from each other; emphasis is on the difference between the linear and exponential relationships. State Assessment Boundary: • Calculations or manipulation of the formula for kinetic energy is not expected in state assessment.	**SE/TE:** 416–417, What Are Two Types of Energy? 417, Do the Math! 420–422, How Can You Find an Object's Mechanical Energy? **TE Only:** 417, Differentiated Instruction 417, 21st Century Learning 437A, Performance Expectation Activity **Online:** Quick Lab: Mass, Velocity, and Kinetic Energy Quick Lab: Sources of Energy
7.MS-PS3-2. Develop a model to describe the relationship between the relative position of objects interacting at a distance and their relative potential energy in the system. *Clarification Statements:* • Examples of objects within systems interacting at varying distances could include the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves; changing the direction/orientation of a magnet; and, a balloon with static electrical charge being brought closer to a stream of water. • Examples of models could include representations, diagrams, pictures, and written descriptions of systems. *State Assessment Boundaries:* • State assessment will be limited to electric, magnetic, and gravitational interactions and to interactions of two objects at a time. • Calculations of potential energy are not expected in state assessment.	**SE/TE:** 412–413, Scenario Investigation: Stuck at the Top 418–419, What Are Two Types of Energy? 420–422, How Can You Find an Object's Mechanical Energy? **TE Only:** 418, 21st Century Learning 419, Differentiated Instruction 437B, Performance Expectation Activity **Online:** Quick Lab: Sources of Energy

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
7.MS-PS3-3. Apply scientific principles of energy and heat transfer to design, construct, and test a device to minimize or maximize thermal energy transfer.* *Clarification Statement:* • Examples of devices could include an insulated box, a solar cooker, and a vacuum flask. *State Assessment Boundary:* • Accounting for specific heat or calculations of the total amount of thermal energy transferred are not expected in state assessment.	**SE/TE:** 442–443, Scenario Investigation: Where Is the Battery? 446–447, What Is Thermal Energy? 448–449, How is Heat Transferred? 450–451, Explore the Big Question: Where Does Heat Transfer on This Beach? 452–455, How Do Different Materials Respond to Heat? **TE Only:** 446, Professional Development Note 447, Differentiated Instruction 451, Differentiated Instruction 455, Differentiated Instruction 461A, Performance Expectation Activity **Online:** Quick Lab: Temperature and Thermal Energy Inquiry Warm-Up: What Does It Mean to Heat Up? STEM Quest: Keep the Cold Out STEM Quest: Keep the Heat In
7.MS-PS3-4. Conduct an investigation to determine the relationships among the energy transferred, how well the type of matter retains or radiates heat, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. *State Assessment Boundary:* • Calculations of specific heat or the total amount of thermal energy transferred are not expected in state assessment.	**SE/TE:** 448–449, How Is Heat Transferred? 450–451, Where Does Heat Transfer on This Beach? 452–455, How Do Different Materials Respond to Heat? **TE Only:** 450, 21st Century Learning 451, Differentiated Instruction 453, 21st Century Learning 455, Differentiated Instruction 461B, Performance Expectation Activity **Online:** Inquiry Warm-Up: What Does It Mean to Heat Up? Quick Lab: Frosty Balloon

Science and Technology / Engineering Learning Standards	**Massachusetts Interactive Science ©2017 Grade 7**
7.MS-PS3-5. Present evidence to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. *Clarification Statement:* • Examples of empirical evidence could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of an object. *State Assessment Boundary:* • Calculations of energy are not expected in state assessment.	**SE/TE:** 416–417, What Are Two Types of Energy? 422, How Can You Find an Object's Mechanical Energy? **TE Only:** 417, Differentiated Instruction 417, 21st Century Learning 419, Differentiated Instruction 437C, Performance Expectation Activity **Online:** Quick Lab: Mass, Velocity, and Kinetic Energy
7.MS-PS3-6(MA). Use a model to explain how thermal energy is transferred out of hotter regions or objects and into colder ones by convection, conduction, and radiation.	**SE/TE:** 448–449, How Is Heat Transferred? 450–451, Explore the Big Question: Where Does Heat Transfer on This Beach? 453, How Do Different Materials Respond to Heat? **TE Only:** 449, ELL Support 450, 21st Century Learning 451, Differentiated Instruction 453, 21st Century Learning 455, Differentiated Instruction 461C, Performance Expectation Activity **Online:** Quick Lab: Visualizing Convection Currents

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
7.MS-PS3-7(MA). Use informational text to describe the relationship between kinetic and potential energy and illustrate conversions from one form to another. *Clarification Statement:* • Types of kinetic energy include motion, sound, thermal and light; types of potential energy include gravitational, elastic, and chemical.	**SE/TE:** 412–431, Scenario Investigation: Stuck at the Top 416–419, What Are Two Types of Energy? 420–422, How Can You Find an Object's Mechanical Energy? 428–429, How Are Different Forms of Energy Related? **TE Only:** 417, Differentiated Instruction 417, 21st Century Learning 418, 21st Century Learning 419, Differentiated Instruction 425, Differentiated Instruction 429, Differentiated Instruction 437D, Performance Expectation Activity **Online:** Quick Lab: Mass, Velocity, and Kinetic Energy Quick Lab: Determining Mechanical Energy Quick Lab: Sources of Energy Quick Lab: Soaring Straws
Technology/Engineering	
ETS1. Engineering Design	
7.MS-ETS1-2. Evaluate competing solutions to a given design problem using a decision matrix to determine how well each meets the criteria and constraints of the problem. Use a model of each solution to evaluate how variations in one or more design features, including size, shape, weight, or cost, may affect the function or effectiveness of the solution.*	**TE Only:** 579A, 627A, Performance Expectation Activity
7.MS-ETS1-4. Generate and analyze data from iterative testing and modification of a proposed object, tool, or process to optimize the object, tool, or process for its intended purpose.*	**TE Only:** 579B, 627B, Performance Expectation Activity **Online:** STEM Quest: Pack Building

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
7.MS-ETS1-7(MA). Construct a prototype of a solution to a given design problem.*	**SE/TE:** 37, STEM Activity: Shake, Rattle, and Roll 139, STEM Activity: I Wouldn't Drink That! 188, STEM Activity: It's All Water Under the Dam 330, STEM Activity: River Works **TE Only:** 579C, 627C, Performance Expectation Activity **Online:** STEM Quest: Heat It Up or Ice It Down
ETS3. Technological Systems	
7.MS-ETS3-1(MA). Explain the function of a communication system and the role of its components, including a source, encoder, transmitter, receiver, decoder, and storage.	**SE/TE:** 503, Technology and History: A Shocking Message! **TE Only:** 579D, 627D, Performance Expectation Activity
7.MS-ETS3-2(MA). Compare the benefits and drawbacks of different communication systems. *Clarification Statements:* • Examples of communications systems can include radio, television, print, and internet. • Examples of benefits and drawbacks can include speed of communication, distance or range, number of people reached, audio only vs. audio and visual, and one-way vs. two-way communication.	**SE/TE:** 503, Technology and History: A Shocking Message! **TE Only:** 579E, 627E, Performance Expectation Activity
7.MS-ETS3-3(MA). Research and communicate information about how transportation systems are designed to move people and goods using a variety of vehicles and devices. Identify and describe subsystems of a transportation vehicle, including structural, propulsion, guidance, suspension, and control subsystems. *Clarification Statements:* • Examples of design elements include vehicle shape to maximize cargo or passenger capacity, terminals, travel lanes, and communications/controls. • Examples of vehicles can include a car, sailboat, and small airplane.	**SE/TE:** 126–127, How Can We Ensure There Will Be Enough Energy for the Future? 126, Apply It! 132, Science Matters: How Low Is Low Impact? 387, How Do Human Activities Affect Ecosystems? **TE Only:** 127, Differentiated Instruction 579F, 627F, Performance Expectation Activity

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 7
7.MS-ETS3-4(MA). Show how the components of a structural system work together to serve a structural function. Provide examples of physical structures and relate their design to their intended use. *Clarification Statements:* • Examples of components of a structural system could include foundation, decking, wall, and roofing. • Explanations of function should include identification of live vs. dead loads and forces of tension, torsion, compression, and shear. • Examples of uses include carrying loads and forces across a span (such as a bridge), providing livable space (such as a house or office building), and providing specific environmental conditions (such as a greenhouse or cold storage). *State Assessment Boundary:* • Calculations of magnitude or direction of loads or forces are not expected in state assessment.	**TE Only:** 579G, 627G, Performance Expectation Activity
7.MS-ETS3-5(MA). Use the concept of systems engineering to model inputs, processes, outputs, and feedback among components of a transportation, structural, or communication system.	**TE Only:** 579H, 627H, Performance Expectation Activity

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GRADE 8	
Cause and Effect Grade 8 students use more robust abstract thinking skills to explain causes of complex phenomena and systems. Many causes are not immediately or physically visible to students. An understanding of cause and effect of key natural phenomena and designed processes allows students to explain patterns and make predictions about future events. In grade 8 these include, for example, causes of seasons and tides; causes of plate tectonics and weather or climate; the role of genetics in reproduction, heredity, and artificial selection; and how atoms and molecules interact to explain the substances that make up the world and how materials change. Being able to analyze phenomena for evidence of causes and processes that often cannot be seen, and being able to conceptualize and describe those, is a significant outcome for grade 8 students.	
Earth and Space Sciences	
ESS1. Earth's Place in the Universe	
8.MS-ESS1-1b. Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and differential intensity of sunlight on different areas of Earth across the year. *Clarification Statement:* • Examples of models can be physical or graphical.	**SE/TE:** 6–7, Scenario Investigation: Smearing Causes Seasons 14–17, How Does Earth Move? 18–20, What Causes Seasons? **TE Only:** 15, ELL Support 16, 21st Century Learning 17, 19, 21, Differentiated Instruction 19, Differentiated Instruction 20, 21st Century Learning 21, Differentiated Instruction 35A, Performance Expectation Activity **Online:** Quick Lab: Sun Shadows Lab Investigation: Reasons for the Seasons

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 8
8.MS-ESS1-2. Explain the role of gravity in ocean tides, the orbital motions of planets, their moons, and asteroids in the solar system. *State Assessment Boundary:* • Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth are not expected in state assessment.	**SE/TE:** 9, What Can You See in the Night Sky? 15, How Does Earth Move? 23–24, What Are Tides? 25, Apply It! 568, What Factors Affect Gravity? 584–585, What Keeps a Satellite in Orbit? **TE Only:** 14A, Professional Development Note: Content Refresher 21, 21st Century Learning 25, Differentiated Instruction 35B, 599C, Performance Expectation Activity **Online:** Quick Lab: Modeling the Moon's Pull of Gravity Quick Lab: Orbiting Earth

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ESS2. Earth's Systems	
8.MS-ESS2-1. Use a model to illustrate that energy from the Earth's interior drives convection which cycles Earth's crust leading to melting, crystallization, weathering, and deformation of large rock formations, including generation of ocean sea floor at ridges, submergence of ocean sea floor at trenches, mountain building, and active volcanic chains. *Clarification Statement:* • The emphasis is on large-scale cycling resulting from plate tectonics.	**SE/TE:** 42–45, What Are the Main Parts of the Earth System? 46–47, How Do Constructive and Destructive Forces Change Earth? 48–49, How Do Geologists Learn About Earth's Interior? 50–53, What Are the Features of Earth's Crust, Mantle, and Core? 54–55, Explore the Big Question: Earth's Interior 58–59, How Does Convection Occur in Earth's Mantle **TE Only:** 45, Differentiated Instruction 47, Differentiated Instruction 51, Differentiated Instruction 51, 21st Century Learning 53, Differentiated Instruction 53, 21st Century Learning 58, Professional Development Note 59, Differentiated Instruction 59, Teacher Demo: Predict the Effect of Density 65A, Performance Expectation Activity **Online:** Quick Lab: Parts of the Earth System Quick Lab: What Forces Shape Earth? Quick Lab: Build a Model of Earth Quick Lab: Modeling Mantle Convection

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8.MS-ESS2-5. Interpret basic weather data to identify patterns in air mass interactions and the relationship of those patterns to local weather. *Clarification Statements:* • Data includes temperature, pressure, humidity, precipitation, and wind. • Examples of patterns can include air masses flow from regions of high pressure to low pressure, and how sudden changes in weather can result when different air masses collide. • Data can be provided to students (such as in weather maps, data tables, diagrams, or visualizations) or obtained through field observations or laboratory experiments. *State Assessment Boundary:* • Specific names of cloud types or weather symbols used on weather maps are not expected in state assessment.	**SE/TE:** 122–123, What Are Some Properties of Air? 125, What Instruments Measure Air Pressure? 162–163, Scenario Investigation: Predicting the Weather Is No Sport 164–165, How Does Water Move Through the Atmosphere? 166–167, What Is Relative Humidity and How Is It Measured? 173–175, What Are the Common Types of Precipitation? 179–181, What Are the Major Air Masses? 182–183, What Are the Main Types of Fronts? 184, What Weather Do Cyclones and Anticyclones Bring? 185, Apply It! 187–193, How Do the Different Types of Storms Form? 197–198, How Do You Predict the Weather? 199–200, What Can You Learn From Weather Maps? 201, Explore the Big Question: Predicting the Weather **TE Only:** 165, ELL Support 167, Differentiated Instruction 173, ELL Support 175, Differentiated Instruction 180, 188, 190, 197, 21st Century Learning 181, Differentiated Instruction 183, Differentiated Instruction 187, ELL Support 188, 21st Century Learning 188, 21st Century Learning 193, Differentiated Instruction 197, 21st Century Learning 199, Differentiated Instruction 201, Differentiated Instruction 207A, Performance Expectation Activity

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 8
(continued) **8.MS-ESS2-5.** Interpret basic weather data to identify patterns in air mass interactions and the relationship of those patterns to local weather. *Clarification Statements:* • Data includes temperature, pressure, humidity, precipitation, and wind. • Examples of patterns can include air masses flow from regions of high pressure to low pressure, and how sudden changes in weather can result when different air masses collide. • Data can be provided to students (such as in weather maps, data tables, diagrams, or visualizations) or obtained through field observations or laboratory experiments. *State Assessment Boundary:* • Specific names of cloud types or weather symbols used on weather maps are not expected in state assessment.	**Online:** Quick Lab: Properties of Air Quick Lab: Measuring to Find the Dew Point Quick Lab: Types of Precipitation Quick Lab: Tracking Air Masses Quick Lab: Weather Fronts Quick Lab: Where Do Hurricanes Come From? Lab Investigation: Reading a Weather Map

Science and Technology / Engineering Learning Standards	Massachusetts Interactive Science ©2017 Grade 8
8.MS-ESS2-6. Describe how interactions involving the ocean affect weather and climate on a regional scale, including the influence of the ocean temperature as mediated by energy input from the sun and energy loss due to evaporation or redistribution via ocean currents. *Clarification Statement:* • A regional scale includes a state or multi-state perspective. *State Assessment Boundary:* • Koppen Climate Classification names are not expected in state assessment.	**SE/TE:** 121, How Is the Atmosphere a System? 164–165, How Does Water Move Through the Atmosphere? 179–181, What Are the Major Air Masses? 190–191, How Do the Different Types of Storms Form? 212–213, Scenario Investigation: What Causes Our Climate? 214, My Planet Diary: Changes in Climate 218–219, What Factors Affect Temperature? 233–235, What Causes Surface Currents? 241, What Natural Factors Can Cause Climate Change? **TE Only:** 121, Differentiated Instruction 157A, 207B, 255A, Performance Expectation Activity 179, ELL Support 181, Differentiated Instruction 214A, Professional Development Note 219, Differentiated Instruction 233, ELL Support 235, Differentiated Instruction **Online:** Quick Lab: What Is the Source of Earth's Energy? Quick Lab: Tracking Air Masses Lab Investigation: Modeling Ocean Currents Quick Lab: Deep Currents

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ESS3. Earth and Human Activity	
8.MS-ESS3-1. Analyze and interpret data to explain that the Earth's mineral and fossil fuel resources are unevenly distributed as a result of geologic processes. *Clarification Statement:* • Examples of uneven distributions of resources can include where petroleum is generally found (locations of the burial of organic marine sediments and subsequent geologic traps), and where metal ores are generally found (locations of past volcanic and hydrothermal activity).	**SE/TE:** 83, How Do Minerals Form? 95, What Are the Three Major Types of Sedimentary Rocks? **TE Only:** 92A, Professional Development Note 111A, Performance Expectation Activity **Online:** Quick Lab: Fossil Fuels
8.MS-ESS3-5. Examine and interpret data to describe the role that human activities have played in causing the rise in global temperatures over the past century. *Clarification Statements:* • Examples of human activities include fossil fuel combustion, deforestation, and agricultural activity. • Examples of evidence can include tables, graphs, and maps of global and regional temperatures; atmospheric levels of gases such as carbon dioxide and methane; and, the rates of human activities.	**SE/TE:** 244, My Planet Diary: How Big Is Your Footprint? 244–248, How Are Human Activities Affecting Earth's Climate? 249, Explore the Big Question: Climate in the Media **TE Only:** 245, ELL Support 247, Differentiated Instruction 247, 21st Century Learning 248, 21st Century Learning 249, Differentiated Instruction 255B, Performance Expectation Activity **Online:** Quick Lab: Greenhouse Gases and Global Warming

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Life Science	
LS1. From Molecules to Organisms: Structures and Processes	
8.MS-LS1-5. Construct an argument based on evidence for how environmental and genetic factors influence the growth of organisms. *Clarification Statements:* • Examples of environmental conditions could include availability of food, light, space, and water. • Examples of genetic factors could include the genes responsible for size differences in different breeds of dogs, such as great danes and chihuahuas. • Examples of environmental factors could include drought decreasing plant growth, fertilizer increasing plant growth, and fish growing larger in large ponds than they do in small ponds. • Examples of both genetic and environmental factors could include different varieties of plants growing at different rates in different conditions. *State Assessment Boundary:* • Methods of reproduction, genetic mechanisms, gene regulation, biochemical processes, or natural selection are not expected in state assessment.	**SE/TE:** 260–261, Scenario Investigation: Plants in Space 262–264, What Characteristics Do All Plants Share? 265–267, What Do Plants Need to Live Successfully on Land? 279–280, What Are Three Stimuli That Produce Plant Responses? 280–282, How Do Plants Respond to Seasonal Changes? 332–333, Scenario Investigation: We All Have It, So It Must Be Dominant! 334–336, What Did Mendel Observe? 337–339, How Do Alleles Affect Inheritance? 349-351, How Do Genes and the Environment Interact? **TE Only:** 263, ELL Support 265, Differentiated Instruction 266, 21st Century Learning 267, Differentiated Instruction 278A, Professional Development Note: Content Refresher 278, My Planet Diary: Flower Power 281, Differentiated Instruction 281, 21st Century Learning 293A, Performance Expectation Activity 335, ELL Support 339, 21st Century Learning **Online:** Inquiry Warm-Up: Can a Plant Respond to Touch? Quick Lab: Watching Roots Grow Quick Lab: Seasonal Changes Quick Lab: Inferring the Parent Generation

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8.MS-LS1-7. Use informational text to describe that food molecules, including carbohydrates, proteins, and fats, are broken down and rearranged through chemical reactions forming new molecules that support cell growth and/or release of energy. *State Assessment Boundary:* • Specific details of the chemical reaction for cellular respiration, biochemical steps of breaking down food, or the resulting molecules (e.g., carbohydrates are broken down into monosaccharides) are not expected in state assessment.	**SE/TE:** 303–304, How Do Living Things Get Energy From the Sun? 308–310, What Happens During Cellular Respiration? 313, Explore the Big Question: Energy for Life **TE Only:** 308A, Professional Development Note: Content Refresher 309, ELL Support 309, 21st Century Learning 313, Differentiated Instruction 327A, Performance Expectation Activity
LS3. Heredity: Inheritance and Variation of Traits	
8.MS-LS3-1. Develop and use a model to describe that structural changes to genes (mutations) may or may not result in changes to proteins, and if there are changes to proteins there may be harmful, beneficial, or neutral changes to traits. *Clarification Statements:* • An example of a beneficial change to the organism may be a strain of bacteria becoming resistant to an antibiotic. • A harmful change could be the development of cancer; a neutral change may change the hair color of an organism with no direct consequence. *State Assessment Boundary:* • Specific changes at the molecular level (e.g., amino acid sequence change), mechanisms for protein synthesis, or specific types of mutations are not expected in state assessment.	**SE/TE:** 380, My Planet Diary: Dairy DNA 381–382, How Can Mutations Affect an Organism? 383–385, How Is Cancer Related to Mutations and Cell Cycle? 395–397, How Can Organisms Be Produced With Desired Traits? 403, Science Matters: Fighting Cancer **TE Only:** 380A, Professional Development Note: Content Refresher 381, ELL Support 383, 385, 397, Differentiated Instruction 383, 21st Century Learning 384, 21st Century Learning 385, Differentiated Instruction 397, Differentiated Instruction 403A, Performance Expectation Activity **Online:** Quick Lab: Effects of Mutations Quick Lab: What Happens When There Are Too Many Cells?

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8.MS-LS3-2. Construct an argument based on evidence for how asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. Compare and contrast advantages and disadvantages of asexual and sexual reproduction. *Clarification Statements:* • Examples of an advantage of sexual reproduction can include genetic variation when the environment changes or a disease is introduced, while examples of an advantage of asexual reproduction can include not using energy to find a mate and fast reproduction rates. • Examples of a disadvantage of sexual reproduction can include using resources to find a mate, while a disadvantage in asexual reproduction can be the lack of genetic variation when the environment changes or a disease is introduced.	**SE/TE:** 328–329, The Big Question 334–336, What Did Mendel Observe? 346–348, How Are Most Traits Inherited? 349–350, How Do Genes and the Environment Interact? 350–351, Explore the Big Question: Patterns of Inheritance 354–355, How Are Chromosomes, Genes, and Inheritance Related? 356–357, What Happens During Meiosis? 363, Science Matters: Seeing Spots **TE Only:** 335, ELL Support 347, ELL Support 349, 21st Century Learning 351, Differentiated Instruction 363A, Performance Expectation Activity **Online:** Inquiry Warm-Up: What Does the Father Look Like? Quick Lab: Patterns of Inheritance Quick Lab: Is It All In the Genes? Quick Lab: Chromosomes and Inheritance STEM Quest: All in the Numbers
8.MS-LS3-3(MA). Communicate through writing and in diagrams that chromosomes contain many distinct genes and that each gene holds the instructions for the production of specific proteins, which in turn affects the traits of an individual. *State Assessment Boundary:* • Specific changes at the molecular level or mechanisms for protein synthesis are not expected in state assessment.	**SE/TE:** 352, My Planet Diary: Chromosome Sleuth 353–355, How Are Chromosomes, Genes, and Inheritance Related? 356–357, What Happens During Meiosis? 372–373, What Forms the Genetic Code? **TE Only:** 353, ELL Support 355, Differentiated Instruction 357, Differentiated Instruction 363B, 403B, Performance Expectation Activity **Online:** Quick Lab: Chromosomes and Inheritance Quick Lab: Modeling Meiosis

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8.MS-LS3-4(MA). Develop and use a model to show that sexually reproducing organisms have two of each chromosome in their nucleus, and hence two variants (alleles) of each gene that can be the same or different from each other, with one random assortment of each chromosome passed down to offspring from both parents. *Clarification Statement:* • Examples of models can include Punnett squares, diagrams (e.g., simple pedigrees), and simulations. *State Assessment Boundary:* • State assessment will limit inheritance patterns to dominant-recessive alleles only.	**SE/TE:** 334–336, What Did Mendel Observe? 337–339, How Do Alleles Affect Inheritance? 342–343, Punnett Squares 344, What Are Phenotype and Genotype? 345, Apply It! 346–348, How Are Most Traits Inherited? 371–373, What Forms the Genetic Code? 386–388, What Are Some Patterns of Human Inheritance? 389–391, What Are the Functions of the Sex Chromosomes? **TE Only:** 334A, Professional Development Note: Content Refresher 335, ELL Support 337, 349, 389, 391, Differentiated Instruction 340A, Professional Development Note: Content Refresher 347, ELL Support 349, Differentiated Instruction 363C, 403C, Performance Expectation Activity 386A, Professional Development Note: Content Refresher 389, Differentiated Instruction 390, 21st Century Learning 391, Differentiated Instruction **Online:** Inquiry Warm-Up: What Does the Father Look Like? Quick Lab: Inferring the Parent Generation Quick Lab: Coin Crosses Inquiry Warm-Up: Observing Traits Quick Lab: Patterns of Inheritance Quick Lab: The Eyes Have It Lab Investigation: How Are Genes on the Sex Chromosomes Inherited?

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LS4. Biological Evolution: Unity and Diversity	
8.MS-LS4-4. Use a model to describe the process of natural selection, in which genetic variations of some traits in a population increase some individuals' likelihood of surviving and reproducing in a changing environment. Provide evidence that natural selection occurs over many generations. *Clarification Statements:* • The model should include simple probability statements and proportional reasoning. • Examples of evidence can include Darwin's finches, necks of giraffes, and peppered moths. *State Assessment Boundary:* • Specific conditions that lead to natural selection are not expected in state assessment.	**SE/TE:** 408–409, Scenario Investigation: Worms Under Attack! 411–415, What Was Darwin's Hypothesis? 416, What Is Natural Selection? 416–419, Explore the Big Question: Factors that Affect Natural Selection 420, My Planet Diary: Moving On Up 421–423, What Evidence Supports Evolution? 424, My Planet Diary: Crickets, Maggots, and Flies, Oh My! 424–425, How Do New Species Form? 426–427, What Patterns Describe the Rate of Evolution? 433, Science Matters: Walking Whales? **TE Only:** 410A, Professional Development Note: Content Refresher 413, Differentiated Instruction 414, 21st Century Learning 415, Differentiated Instruction 417, Differentiated Instruction 419, Differentiated Instruction 427, Differentiated Instruction 433A, Performance Expectation Activity **Online:** Inquiry Warm-Up: How Do Living Things Vary? Quick Lab: Bird Beak Adaptations Lab Investigation: Nature At Work Quick Lab: Finding Proof Quick Lab: Slow or Fast?

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8.MS-LS4-5. Synthesize and communicate information about artificial selection, or the ways in which humans have changed the inheritance of desired traits in organisms. *Clarification Statement:* • Emphasis is on the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, and gene therapy).	**SE/TE:** 392, My Planet Diary: Zorses and Zedonks 393–397, How Can Organisms Be Produced With Desired Traits? 414, Apply It! 415, Artificial Selection **TE Only:** 393, ELL Support 393, 21st Century Learning 395, Differentiated Instruction 396, 21st Century Learning 403D, 433B, Performance Expectation Activity 415, Differentiated Instruction **Online:** Quick Lab: Selective Breeding

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Physical Science	
PS1. Matter and Its Interactions	
8.MS-PS1-1. Develop a model to describe that (a) atoms combine in a multitude of ways to produce pure substances which make up all of the living and nonliving things that we encounter, (b) atoms form molecules and compounds that range in size from two to thousands of atoms, and (c) mixtures are composed of different proportions of pure substances. *Clarification Statement:* • Examples of molecular-level models could include drawings, 3D ball and stick structures, and computer representations showing different molecules with different types of atoms. *State Assessment Boundary:* • Valence electrons and bonding energy, the ionic nature of subunits of complex structures, complete depictions of all individual atoms in a complex molecule or extended structure, or calculations of proportions in mixtures are not expected in state assessment.	**SE/TE:** 472–473, Scenario Investigation: Bonding Super Heroes 475–476, What Is a Model of the Atom? 477–481, What Determines an Element's Chemistry? 491–492, How Are Atoms Held Together in a Covalent Bond? 493–494, What Are Properties of Molecular Compounds? 496–497, Explore the Big Question: A Sea of Bonding 499, What Is the Structure of a Metal Crystal? 500–503, What Are Properties of Metals? **TE Only:** 474A, Professional Development Note: Content Refresher 492, Professional Development Note 475, Differentiated Instruction 481, Differentiated Instruction 493, 502, 21st Century Learning 498A, Professional Development Note: Content Refresher 501, Differentiated Instruction 502, 21st Century Learning 509A, Performance Expectation Activity **Online:** Quick Lab: Sharing Electrons Quick Lab: Metal Crystals

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8.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. *Clarification Statements:* • Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with HCl. • Properties of substances include density, melting point, boiling point, solubility, flammability, and odor.	**SE/TE:** 516, My Planet Diary: Chemistry in the Kitchen 517–519, How Can Changes in Matter Be Described? 518, Apply It! 520–522, How Do You Identify a Chemical Reaction 523, Do the Math! 524–526, What Information Does a Chemical Equation Contain? 528–531, How Is Mass Conserved During a Chemical Reaction? 532–533, Explore the Big Question: How Can Chemical Reactions Generate Speed? 534–535, What Are Three Types of Chemical Reactions? 537–538, How Do Reactions Get Started? 539–541, What Affects the Rate of a Chemical Reaction? **TE Only:** 517, ELL Support 518, Professional Development Note 519, Differentiated Instruction 521, Differentiated Instruction 521, 21st Century Learning 522, 21st Century Learning 523, Differentiated Instruction 524A, Professional Development Note: Content Refresher 533, Differentiated Instruction 535, Differentiated Instruction 536A, Professional Development Note: Content Refresher 537, ELL Support 539, Differentiated Instruction 547A, Performance Expectation Activity

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(continued) **8.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. *Clarification Statements:* • Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with HCl. • Properties of substances include density, melting point, boiling point, solubility, flammability, and odor.	**Online:** Quick Lab: Observing Change Lab Investigation: Where's the Evidence? Quick Lab: Information in a Chemical Equation Quick Lab: Categories of Chemical Reactions Quick Lab: Modeling Activation Energy Quick Lab: Effect of Temperature on Chemical Reactions
8.MS-PS1-4. Develop a model that describes and predicts changes in particle motion, relative spatial arrangement, temperature, and state of a pure substance when thermal energy is added or removed. *Clarification Statements:* • Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. • Examples of models could include drawings and diagrams. • Examples of pure substances could include water, carbon dioxide, and helium.	**SE/TE:** 438–439, Scenario Investigation: My Glass Is Leaking? 442, How Do You Describe a Solid? 447, How Do You Describe a Gas? 448, My Planet Diary: On the Boil 449–450, What Happens to the Particles of a Solid as It Melts? 450, Apply It! 451–452, What Happens to the Particles of a Liquid as It Vaporizes? 453, What Happens to the Particles of a Solid as It Sublimes? 454–455, Explore the Big Question: The Changing States of Water 458–459, How Are Volume and Temperature of a Gas Related? **TE Only:** 447, Differentiated Instruction 448A, Professional Development Note 449, ELL Support 452, Differentiated Instruction 455, Differentiated Instruction 467A, Performance Expectation Activity **Online:** Lab Investigation: Melting Ice Quick Lab: Keep Cool Quick Lab: Hot and Cold Balloons

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8.MS-PS1-5. Use a model to explain that atoms are rearranged during a chemical reaction to form new substances with new properties. Explain that the atoms present in the reactants are all present in the products and thus the total number of atoms is conserved. *Clarification Statement:* • Examples of models can include physical models or drawings, including digital forms, that represent atoms. *State Assessment Boundary:* • Use of atomic masses, molecular weights, balancing symbolic equations, or intermolecular forces are not expected in state assessment.	**SE/TE:** 524–526, What Information Does a Chemical Equation Contain? 527, Apply It! 528–531, How Is Mass Conserved During a Chemical Reaction? 532–533, Explore the Big Question: How Can Chemical Reactions Generate Speed? 534–535, What Are Three Types of Chemical Reactions? **TE Only:** 527, Differentiated Instruction 531, Differentiated Instruction 531, 21st Century Learning 534, 21st Century Learning 547B, Performance Expectation Activity **Online:** Quick Lab: Information In a Chemical Equation Quick Lab: Is Matter Conserved?
PS2. Motion and Stability: Forces and Interactions	
8.MS-PS2-1. Develop a model that demonstrates Newton's third law involving the motion of two colliding objects. *State Assessment Boundary:* • State assessment will be limited to vertical or horizontal interactions in one dimension.	**SE/TE:** 574–575, What Is Newton's Third Law of Motion? 577, Explore the Big Question: What Makes a Bug Go Splat? **TE Only:** 574, Professional Development Note 575, 21st Century Learning 575, Differentiated Learning 577, Differentiated Learning 599A, Performance Expectation Activity **Online:** Inquiry Warm-Up: What Changes Motion? Quick Lab: Interpreting Illustrations Quick Lab: Colliding Cars Inquiry Warm-Up: Is the Force With You?

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8.MS-PS2-2. Provide evidence that the change in an object's speed depends on the sum of the forces on the object (the net force) and the mass of the object. *Clarification Statement:* • Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass, and changes in speed (Newton's Second Law) in one dimension. *State Assessment Boundaries:* • State assessment will be limited to forces and changes in motion in one dimension in an inertial reference frame and to change in one variable at a time. • The use of trigonometry is not expected in state assessment.	**SE/TE:** 556, My Planet Diary: Forced to Change 556–558, What Is Acceleration? 559, How Are Forces Described? 560–561, How Do Forces Affect Motion? 570–571, What Is Newton's First Law of Motion? 572–573, What Is Newton's Second Law of Motion? **TE Only:** 557, Teacher Demo: Flying Balloons 558, 21st Century Learning 561, Differentiated Instruction 561, 21st Century Learning 570A, Professional Development Note 572, Teacher Demo: Force Affects Acceleration 573, Differentiated Instruction 599B, Performance Expectation Activity **Online:** Quick Lab: What Is Force? Quick Lab: Modeling Unbalanced Forces Inquiry Warm-Up: What Changes Motion? Quick Lab: Around and Around Quick Lab: Newton's Second Law

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Technology/Engineering	
ETS2. Materials, Tools, and Manufacturing	
8.MS-ETS2-4(MA). Use informational text to illustrate that materials maintain their composition under various kinds of physical processing; however, some material properties may change if a process changes the particulate structure of a material. *Clarification Statements:* • Examples of physical processing can include cutting, forming, extruding, and sanding. • Examples of changes in material properties can include a non-magnetic iron material becoming magnetic after hammering and a plastic material becoming rigid (less elastic) after heat treatment.	**SE/TE:** 500–503, What Are Properties of Metals? 518, How Can Changes in Matter Be Described? 518, Apply It! **TE Only:** 641A, 691A, Performance Expectation Activity **Online:** Quick Lab: What Do Metals Do?
8.MS-ETS2-5(MA). Present information that illustrates how a product can be created using basic processes in manufacturing systems, including forming, separating, conditioning, assembling, finishing, quality control, and safety. Compare the advantages and disadvantages of human vs. computer control of these processes.	**SE/TE:** 500–503, What Are Properties of Metals? **TE Only:** 502, 21st Century Learning 503, Differentiated Instruction 641B, 691B, Performance Expectation Activity **Online:** Quick Lab: What Do Metals Do?