LAB-AIDS CORRELATIONS FOR

MASSACHUSETTS SCIENCE AND TECHNOLOGY/ENGINEERING LEARNING STANDARDS

GRADES 6-8

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This document shows how SEPUP middle school materials align with the *Massachusetts Science and Technology/Engineering Learning Standards*[1].

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 robust support for assessment. 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
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Note: In Grade 6 the last two citations are 2nd Edition units. Students need to complete only three activities in these two units to address two of the Massachusetts Learning Standards.

Grade 6	Grade 7	Grade 8
Body Systems, 3e	Land, Water, & Human Interactions, 3e	Force and Motion, 3e
Cells to Organisms, 3e	Geological Processes, 3e	Chemistry of Materials, 3e
Evolution, 3e	Ecology, 3e	Chemical Reactions, 3e
Biomedical Engineering, 3e	Energy, 3e	Reproduction, 3e
Earth's Resources, 3e	Fields and Interactions, 3e	Weather and Climate, 3e
Waves, 3e		Solar System & Beyond, 3e
The Chemistry of Materials, 2e		
Studying Materials Scientifically, 2e		

[1] http://www.doe.mass.edu/frameworks/scitech/2016-04.pdf

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 the NGSS Performance Expectation is assessed

Unit title:	The Chemistry of Materials:
Activity Number	14

SIXTH GRADE

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
Earth and Space Sciences	Earth's Place in the Universe	6.ESS.1.1	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.	Solar System and Beyond: 2, 3, 4, 5*
Earth and Space Sciences	Earth's Place in the Universe	6.ESS.1.4	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.	Earth's Resources: 9, 10, 11, 12*
Earth and Space Sciences	Earth's Place in the Universe	6.ESS.1.5	Use graphical displays to illustrate that Earth and its solar system are one of many in 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.	not addressed
Earth and Space Sciences	Earth's Systems	6.ESS.2.3	Analyze and interpret maps showing the distribution of fossils and rocks, continental shapes, and seafloor structures to provide	Geological Processes: 10, 11, 12, 13, 14*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			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.	
Life Science	From Molecules to Organisms: Structures and Processes	6.LS.1.1	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.	From Cells to Organisms: 1, 2, 3, 4, 9*
Life Science	From Molecules to Organisms: Structures and Processes	6.LS.1.2	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	From Cells to Organisms: 6, 7, 8

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			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.	
Life Science	From Molecules to Organisms: Structures and Processes	6.LS.1.3	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 that 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	From Cells to Organisms: 10, 14, 15 Body Systems: 1, 2, 3, 4, 9, 10, 11, 12*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			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.	
Life Science	Biological Evolution: Unity and Diversity	6.LS.4.1	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.	Evolution: 7, 8, 9, 10 11*
Life Science	Biological Evolution: Unity and Diversity	6.LS.4.2	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	Evolution: 7, 8, 9, 10, 11, 12*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			because their environments are different than their ancestors' environments.	
Physical Science	Matter and Its Interactions	6.PS.1.6	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.	Chemical Reactions: 2, 3, 5, 8, 9, 10, 11*
Physical Science	Matter and Its Interactions	6.PS.1.7	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.	Chemistry of Materials: 2, 3, 4, 7
Physical Science	Matter and Its Interactions	6.PS.1.8	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.	addressed in 2nd Edition Unit Studying Materials Scientifically: 3, 5
Physical Science	Motion and Stability: Forces and Interactions	6.PS.2.4	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 Sun, Earth, and other planets. State Assessment Boundary: Newton's law of gravitation or Kepler's laws are not expected in state assessment.	Fields and Interactions: 3, 4, 7*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
Physical Science	Waves and Their Applications in Technologies for Information Transfer	6.PS.4.1	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.	Waves: 1, 2, 3, 7*
Physical Science	Waves and Their Applications in Technologies for Information Transfer	6.PS.4.2	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.	Waves: 3, 4, 8, 9, 10, 11, 12, 13*
Physical Science	Waves and Their Applications in Technologies for Information Transfer	6.PS.4.3	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.	Waves: 5, 6
Technology/Engineering	Engineering Design	6.ETS.1.1	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.*	Biomedical Engineering: 1, 2, 3* Force and Motion: 10, 15*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
				Fields and Interactions: 2, 3, 6*, 13 Land, Water, and Human Interactions: 7, 12*
Technology/Engineering	Engineering Design	6.ETS.1.5	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.	Biomedical Engineering: 4, 5, 9 Fields and Interactions: 1, 6, 13 Land, Water, and Human Interactions: 7, 12, 16
Technology/Engineering	Engineering Design	6.ETS.1.6	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.	Biomedical Engineering: 4, 5, 9 Fields and Interactions: 1, 6, 13 Land, Water, and Human Interactions: 7, 12, 16
Technology/Engineering	Materials, Tools, and Manufacturing	6.ETS.2.1	Analyze and compare properties of metals, plastics, wood, and ceramics, including flexibility, ductility, hardness, thermal conductivity, electrical conductivity, and melting point.	Partially addressed in 2nd Edition Unit The Chemistry of Materials: 14

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
Technology/Engineering	Materials, Tools, and Manufacturing	6.ETS.2.2	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.	Biomedical Engineering: 4, 5, 9
Technology/Engineering	Materials, Tools, and Manufacturing	6.ETS.2.3	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.	Biomedical Engineering: 4, 5, 9

SEVENTH GRADE

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
Earth and Space Sciences	Earth's Systems	7.ESS.2.2	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.	Geological Processes: 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13* Land, Water, and Human Interactions: 3, 4, 6, 7, 8, 10, 11, 12, 13, 14*
Earth and Space Sciences	Earth's Systems	7.ESS.2.4	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.	Land, Water, and Human Interactions: 2, 5, 7, 8, 9
Earth and Space Sciences	Earth and Human Activity	7.ESS.3.2	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,	Geological Processes: 1, 3, 4, 6, 7, 8, 11, 18

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			magnitudes, and frequencies of the natural hazards. State Assessment Boundary: Active analysis of data or forecasting is not expected in state assessment.	
Earth and Space Sciences	Earth and Human Activity	7.ESS.3.4	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.	Earth's Resources: 2, 4, 6, 13* Evolution: 14
Life Science	From Molecules to Organisms: Structures and Processes	7.LS.1.4	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 (a) transferring	Reproduction: 10*, 11*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			pollen or seeds and (b) 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.	
Life Science	Ecosystems: Interactions, Energy, and Dynamics	7.LS.2.1	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.	Ecology: 5, 6, 9*
Life Science	Ecosystems: Interactions, Energy, and Dynamics	7.LS.2.2	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.	Ecology: 2, 8, 10*
Life Science	Ecosystems: Interactions, Energy, and Dynamics	7.LS.2.3	Develop a model to describe that matter and energy are transferred 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, as well as transfer among producers,	Ecology: 7, 8, 11, 12* From Cells to Organisms: 13

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			consumers (primary, secondary, and tertiary), 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.	
Life Science	Ecosystems: Interactions, Energy, and Dynamics	7.LS.2.4	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.	Ecology: 1, 2, 3, 4, 5, 6, 13, 14*
Life Science	Ecosystems: Interactions, Energy, and Dynamics	7.LS.2.5	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.	Ecology: 2, 4, 15*
Life Science	Ecosystems: Interactions, Energy, and Dynamics	7.LS.2.6	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.	not addressed

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
Physical Science	Motion and Stability: Forces and Interactions	7.PS.2.3	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.	Fields and Interactions: 8, 9, 10, 11, 12, 13*, 14
Physical Science	Motion and Stability: Forces and Interactions	7.PS.2.5	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.	Fields and Interactions: 5, 7, 9, 10, 12*
Physical Science	Energy	7.PS.3.1	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-sized 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: Calculation or	Force and Motion: 1, 2, 3, 4, 5*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			manipulation of the formula for kinetic energy is not expected in state assessment.	
Physical Science	Energy	7.PS.3.2	Develop a model to describe the relationship between the relative positions 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 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.	Fields and Interactions: 3, 4, 6, 7, 10, 11* Force and Motion: 1, 3, 4, 5, 10, 14
Physical Science	Energy	7.PS.3.3	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	Energy: 1, 7, 8, 10, 11, 12, 13*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			amount of thermal energy transferred is not expected in state assessment.	
Physical Science	Energy	7.PS.3.4	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.	Energy: 1, 4, 6, 7, 8*
Physical Science	Energy	7.PS.3.5	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.	Energy: 2, 3, 4, 5, 6*
Physical Science	Energy	7.PS.3.6	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.	Energy: 13
Physical Science	Energy	7.PS.3.7	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,	Energy: 2, 3

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			and light; types of potential energy include gravitational, elastic, and chemical.	
Technology/Engineering	Engineering Design	7.ETS.1.2	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.*	Fields and Interactions: 6, 13, 15 Land, Water, and Human Interactions: 7, 12, 16*
Technology/Engineering	Engineering Design	7.ETS.1.4	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.*	Fields and Interactions: 1, 2, 3, 6, 11, 13*
Technology/Engineering	Engineering Design	7.ETS.1.7	Construct a prototype of a solution to a given design problem.*	Fields and Interactions: 3, 6, 13 Land, Water, and Human Interactions: 7, 12, 16*
Technology/Engineering	Technological Systems	7.ETS.3.1	Explain the function of a communication system and the role of its components, including a source, encoder, transmitter, receiver, decoder, and storage.	not addressed
Technology/Engineering	Technological Systems	7.ETS.3.2	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.	not addressed

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			audio and visual, and one-way vs. two-way communication.	
Technology/Engineering	Technological Systems	7.ETS.3.3	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.	Fields and Interactions: 2, 3, 6, 13, 15
Technology/Engineering	Technological Systems	7.ETS.3.4	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),	Biomedical Engineering: 4, 5, 8, 9

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			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.	
Technology/Engineering	Technological Systems	7.ETS.3.5	Use the concept of systems engineering to model inputs, processes, outputs, and feedback among components of a transportation, structural, or communication system.	not addressed

EIGHTH GRADE

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
Earth and Space Sciences	Earth's Place in the Universe	8.ESS.1.1	Develop and use a model of the Earth-Sun system to explain the cyclical pattern of seasons, which includes 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.	Solar System and Beyond: 6, 7, 8, 9*
Earth and Space Sciences	Earth's Place in the Universe	8.ESS.1.2	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.	Solar System and Beyond: 10, 11, 12, 14, 15, 16*
Earth and Space Sciences	Earth's Systems	8.ESS.2.1	Use a model to illustrate that energy from Earth's interior drives convection that 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.	Geological Processes: 2, 5, 8, 9, 10, 11, 13, 14, 15*
Earth and Space Sciences	Earth's Systems	8.ESS.2.5	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	Weather and Climate: 2, 3, 7, 9, 10, 11, 12, 13*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			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.	
Earth and Space Sciences	Earth's Systems	8.ESS.2.6	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.	Weather and Climate: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14*
Earth and Space Sciences	Earth and Human Activity	8.ESS.3.1	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	Earth's Resources: 1, 2, 3, 5, 7, 8, 14* Geological Processes: 2, 16*, 17*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			generally found (locations of past volcanic and hydrothermal activity).	
Earth and Space Sciences	Earth and Human Activity	8.ESS.3.5	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.	Weather and Climate: 1, 10, 14, 15, 16*
Life Science	From Molecules to Organisms: Structures and Processes	8.LS.1.5	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	Reproduction: 1, 7*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			regulation, biochemical processes, or natural selection are not expected in state assessment.	
Life Science	From Molecules to Organisms: Structures and Processes	8.LS.1.7	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.	From Cells to Organisms: 5, 11* Body Systems: 5
Life Science	Heredity: Inheritance and Variation of Traits	8.LS.3.1	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.	Reproduction: 1, 3, 8, 12, 13* Evolution: 3, 4, 5*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
Life Science	Heredity: Inheritance and Variation of Traits	8.LS.3.2	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.	Reproduction: 1, 2, 3, 4, 5, 6, 8, 9*
Life Science	Heredity: Inheritance and Variation of Traits	8.LS.3.3	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.	Reproduction: 12, 13*
Life Science	Heredity: Inheritance and Variation of	8.LS.3.4	Develop and use a model to show that sexually reproducing organisms have two of each chromosome in their cell nuclei,	Reproduction: 3, 4, 5, 6, 8, 9

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
	Traits		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.	
Life Science	Biological Evolution: Unity and Diversity	8.LS.4.4	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.	Evolution: 1, 2, 3, 4*
Life Science	Biological Evolution: Unity and Diversity	8.LS.4.5	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	Evolution: 14, 15, 16*

Discipline	Core Idea	Standard Code	Standard Text	SEPUP Unit & Activity #
			in artificial selection (such as genetic modification, animal husbandry, and gene therapy).	
Physical Science	Matter and Its Interactions	8.PS.1.1	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, three-dimensional 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.	Chemistry of Materials: 2, 6, 7, 12*
Physical Science	Matter and Its Interactions	8.PS.1.2	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,	Chemical Reactions: 1, 2, 3, 4, 5*

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			melting point, boiling point, solubility, flammability, and odor.	
Physical Science	Matter and Its Interactions	8.PS.1.4	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.	Chemistry of Materials: 8, 9, 10*
Physical Science	Matter and Its Interactions	8.PS.1.5	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 is not expected in state assessment.	Chemical Reactions: 1, 2, 3, 4, 5, 6, 7*
Physical Science	Motion and Stability: Forces and Interactions	8.PS.2.1	Develop a model that demonstrates Newton's third law involving the motion of two colliding objects. State Assessment Boundary: State assessment will be limited	Force and Motion: 1, 10, 11, 12*

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			to vertical or horizontal interactions in one dimension.	
Physical Science	Motion and Stability: Forces and Interactions	8.PS.2.2	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.	Force and Motion: 1, 6, 7, 8, 9, 13*
Technology/Engineering	Materials, Tools, and Manufacturing	8.ETS.2.4	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.	not addressed
Technology/Engineering	Materials, Tools, and Manufacturing	8.ETS.2.5	Present information that illustrates how a product can be created using basic processes in manufacturing systems,	not addressed

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			including forming, separating, conditioning, assembling, finishing, quality control, and safety. Compare the advantages and disadvantages of human vs. computer control of these processes.	