Unit 1: Earth and Space Science 1

Unit 2: Life Science 11

Unit 3: Physical Sciences 20

Unit 4: Technology and Engineering 28

Unit 5: MCAS Review 33

Subject	PS8
Unit	Unit 1: Earth and Space Science
Est. Length	24 lessons (Aug-Oct)
Big Idea	Natural forces determine the nature of Earth's seasons, tides, climate, and weather patterns.
Essential Questions	1. How does energy from the sun drive seasons, weather patterns, and regional climate? 2. How is land formed and deformed? 3. How has human activity changed the Earth in recent history?
MA State Standards *Power standards in bold	**8.MS-ESS1-1b. 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. 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.

	8.MS-ESS2-1. 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. **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. 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. 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). **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.

Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. ● RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 6 - 8. ● RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. ● RST.6-8.6: Analyze the author's purpose in providing an explanation describing a procedure, or discussing an experiment in text. ● RST.6.8-7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). ● RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. ● RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. ● RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. Writing ● WHST.6-8.1: Write arguments focused on *discipline-specific content*. ○ WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. ○ WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. ○ WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. ○ WHST.6-8.1.D: Establish and maintain a formal style. ○ WHST.6-8.1.E: Provide a concluding statement or section that follows from and supports the argument presented. ● WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. ○ WHST.6-8.2.A: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

	○ WHST.6-8.2.B: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. ○ WHST.6-8.2.C: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. ○ WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic. ○ WHST.6-8.2.E: Establish and maintain a formal style and objective tone. ○ WHST.6-8.2.F: Provide a concluding statement or section that follows from and supports the information or explanation presented. ● WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. ● WHST.6-8.5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. ● WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. ● WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. ● WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. ● WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. ● WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Science Practices (SP)	**1. Asking scientific questions & defining engineering problems** 2. Developing & using models 3. Planning & carrying out investigations **4. Analyzing & interpreting data** 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions **7. Engaging in argument from evidence** 8. Obtaining, evaluating, and communicating information
Assessment	**Minor Assessments** ● Quiz 1.1

Alignment	• RT Reflection Letter **Major Assessments** • **Roundtable Project: Seasons Comic Strip** • Unit Test
Honors Assignments	• Cloud types • Tides in depth • Glacial deformation
20 Key Vocabulary Words	pressure, humidity, precipitation, fossil fuels, evaporation, thermal energy, air mass, gravity, direct sunlight, orbit, rotation, revolution, axis, hemisphere, equator, climate, tide, convection current, mantle, chemical weathering, mechanical weathering, submerging

Prior knowledge that students have entering this unit
1. Plate boundaries descriptions and effects from 6th grade. 2. Basic weather data and vocabulary from 6th grade. 3. Understanding of the time frame and “symptoms” of seasons in MA.

Where this knowledge goes next
1. Effects of climate change comes up again in life science. 2. Heat transfer comes up again in physical sciences and engineering.

Descriptive outline narrative of unit
Students begin the unit studying local weather patterns through data, maps, and local weather. We then move into global weather and the effects of the ocean on weather patterns. After studying weather, students will examine land formation and deformation. Prior knowledge of plate tectonics is important as students create diagrams and physical models of the rock cycle. We then move to a brief look at the causes and effects of climate change. We will close the unit with a study of the effects of gravity. Students will

do an in depth study of the seasons--including physical modeling, diagramming, and the Seasons Comic Strip RT project--and finally, a short look at orbital patterns and the tides.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	ESS1	--	--	SWBAT model student expectations in the PS8 classroom.	(W): Describe one strength and one area for growth using the sentence frames: *My strengths in science this year will be…* *I may struggle this year in science with…*	SP8: Communicating information
2	ESS2	--	--	SWBAT work in groups to complete the straw challenge and reflect on their work.	(L): Follow brief oral instructions from teachers and peers.	SP1: Defining problems
3	ESS3	8.MS-ESS 2-5	RST6-8.3	SWBAT research recent weather data and create a table or graph that displays the data.	(W): Identify temperature data in Massachusetts and organize the data into a written table or graph.	SP5: Using mathematics
4	ESS4	8.MS-ESS 2-5	RST6-8.4	SWBAT measure weather data points, including air temperature, pressure, humidity, precipitation, and wind speed.	(S): Describe current weather using these vocabulary words: *temperature, pressure, humidity, and precipitation.*	SP3: Carrying out investigations
5	ESS5	8.MS-ESS 2-5	RST6-8.4	SWBAT interpret weather maps to identify areas of high and low pressure and explain in writing how colliding air masses affect the weather.	(R): Read a diagram of a weather map and determine the meaning of the diagram using these vocabulary words: *high pressure, low pressure, air mass, or precipitation.*	SP4: Interpreting data

6	ESS6	8.MS-ESS 2-6	WHST6 -8.4	SWBAT justify the claim that large bodies of water are less susceptible to changes in temperature.	(W): Use data to write a 2 - 4 sentence explanation with the paragraph frame: *Large bodies of water like oceans change temperature...My data shows...*	SP6: Constructing scientific explanations
7	ESS7	8.MS-ESS 2-6	WHST6 -8.9	SWBAT use water cycle diagrams to explain that oceans lose thermal energy to evaporation and gain thermal energy from direct sunlight.	(L): Work with a partner to orally describe the water cycle using vocabulary words: *evaporation, thermal energy.*	SP2: Use models
8	ESS8	8.MS-ESS 2-6	RST6-8. 1	SWBAT interpret weather data from across Massachusetts to describe in writing how the ocean drives weather patterns.	(S): Orally describe local weather patterns using the sentence stems: *The ocean drives weather patterns because…* *Evidence that supports my claim is...*	SP4: interpret data
9	ESS9			Closing & Quiz		
10	ESS10	8.MS-ESS 2-1	WHST6 -8.4	SWBAT make written observations of chemical and mechanical weathering.	(W): Write observations using the sentence stems: *I observed chemical weathering when...* *I observed mechanical weathering in...*	SP8: Obtaining information
11	ESS11	8.MS-ESS 2-1	RST6-8. 1	SWBAT predict how tectonic plate boundaries can lead to the formation and deformation of land masses on Earth.	(R): Use an informational text to review the vocabulary terms: *transform, convergent, divergent*.	SP8: Evaluating information
12	ESS12	8.MS-ESS 2-1	WHST6 -8.4	SWBAT explain in writing why convection currents cause magma to cycle.	(W): Explain in 2-4 sentences how magma cycles on Earth, using a diagram and the vocabulary terms *convection*	SP6: Constructing scientific explanations

					current, mantle, submerging.	
13	ESS13	8.MS-ESS 2-1	RST6-8.7	SWBAT use a model to illustrate the cyclical nature of land formation and deformation.	(L): Work with a partner to describe their model of land formation and deformation.	SP2: Use models
14	ESS14	8.MS-ESS 3-5	RST6-8.2	SWBAT use an informational text to identify types of fossil fuels, their origins, their uses, and their outputs.	(R): Use an informational text to explain the meaning of the vocabulary term *fossil fuel.*	SP7: Engaging in argument from evidence
15	ESS15	8.MS-ESS 3-5	RST6-8.7	SWBAT analyze data to identify evidence that shows human activities have caused changes in local air quality and the makeup of the atmosphere.	(S): Describe displays of data using the sentence stem: *This table/graph shows…*	SP4: Analyze data
16	ESS16	8.MS-ESS 3-5	WHST6-8.10	SWBAT use evidence to justify the claim that human use of fossil fuels have caused global temperatures to rise.	(W): Justify the claim in a 5 sentence paragraph using the frame: *The burning of fossil fuels in the last two hundred years has caused… One piece of evidence that supports my claim is...This shows that...Further evidence is...This shows that...*	SP7: Engaging in argument from evidence
17	ESS17	8.MS-ESS 3-1	RST6-8.1	SWBAT explain that fossil fuel energy is derived from the sun's energy.	(R): Use an informational text to identify the origin of fossil fuel as a source of energy.	SP8: Communicating information
18	ESS18	8.MS-ESS 3-1	RST6-8.7	SWBAT use a map to make predictions about where fossil fuel and mineral resources are likely to occur.	(S): Orally predict where resources might be found using the frame: *I predict...because...*	SP4: interpreting data
19	ESS19	8.MS-ESS1-1b	WHST6-8.1.B	SWBAT carry out an investigation to determine the effects of changing the intensity of sunlight on Earth.	(L): Follow group member's oral instructions to complete a task.	SP1: Asking scientific questions
20	ESS20	8.MS-	RST6-8.	SWBAT use a physical model to	(S): Orally explain the Earth-Sun	SP2: Developing models

		ESS1-1b	3	illustrate how the Earth's tilt causes direct sunlight to hit different parts of Earth as it orbits.	model using the vocabulary terms: *direct sunlight, axis, rotation.*	
21	ESS21	8.MS-ESS1-1b	RST6-8.7	SWBAT use a physical model to predict the Northern Hemisphere's four seasons.	(W): Predict the season in the Northern Hemisphere using the vocabulary terms: *hemisphere, equator, axis.*	SP2: Developing models
22	ESS22	8.MS-ESS1-1b	WHST6-8.4	SWBAT create a comic strip to model the cyclical pattern of seasons.	(S): Orally describe the cyclical pattern of the seasons using the sentence frame: *As the Earth orbits...*	SP6: Constructing scientific explanations
23	ESS23	8.MS-ESS1-1b	WHST6-8.4	SWBAT explain in writing how the Earth's tilt and orbit cause the cyclical pattern of the seasons.	(W): Write 1-2 sentences to describe each segment of a comic strip using the frames: *In this diagram…* *This happens because...*	SP8: Communicating information
24	ESS24	8.MS-ESS1-2	WHST6-8.9	SWBAT interpret data to justify the claim that increased mass and decreased distance increase gravitational pull.	(W): Justify the claim in 5 sentences with paragraph frame: *Gravitational pull increases when...My data shows...This is evidence that...My data also shows...This second piece of evidence means...*	SP4: Analyzing data
25	ESS25	8.MS-ESS1-2	WHST6-8.4	SWBAT identify two objects in the Solar System and use an image to explain how gravity affects their orbital motion.	(R): Read a table and diagram to explain how gravity affects orbital motion using the vocabulary words: *gravity, orbit, revolution, rotation.*	SP5: Using computational thinking
26	ESS26	8.MS-ESS1-2	WHST6-8.4	SWBAT predict the locations of high tides given a graphical model of the Earth-Moon system.	(L): Use evidence from a short video to explain why tides happen.	SP7: Engaging in argument from evidence

		8.MS-ESS1-1b	WHST6-8.1	SWBAT reflect on roundtable project in writing.	(W): Reflect in five paragraphs using the stems: *The title of this Roundtable artifact is...* *This artifact shows..* *I am proud of my work…* *One thing I could improve…* *The most important thing I learned when completing this artifact...*	SP8: communicating information

Subject	PS8
Unit	Unit 2: Life Science
Est. Length	24 lessons (Nov - Jan)
Big Idea	Genetic and environmental factors drive changes in traits of an organism and select for the survival of the fittest organisms..
Essential Questions	1. Why do organisms need energy? 2. How do genes and the environment affect an organism's survival? 3. How do species adapt to changes over time?
MA State Standards *Power standards in bold	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. 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. 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. **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. 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. 8.MS-LS3-4(MA)**.** Develop and use a model to show that sexually reproducing organisms have two of each chromosome in their cell nuclei, 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. **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. 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).
Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. ● RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 6 - 8. ● RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. ● RST.6-8.6: Analyze the author's purpose in providing an explanation describing a procedure, or discussing an experiment in text. ● RST.6.8-7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). ● RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. ● RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. ● RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. Writing ● WHST.6-8.1: Write arguments focused on *discipline-specific content*. ○ WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. ○ WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. ○ WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships

	among claim(s), counterclaims, reasons, and evidence. ○ WHST.6-8.1.D: Establish and maintain a formal style. ○ WHST.6-8.1.E: Provide a concluding statement or section that follows from and supports the argument presented. ● WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. ○ WHST.6-8.2.A: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. ○ WHST.6-8.2.B: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. ○ WHST.6-8.2.C: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. ○ WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic. ○ WHST.6-8.2.E: Establish and maintain a formal style and objective tone. ○ WHST.6-8.2.F: Provide a concluding statement or section that follows from and supports the information or explanation presented. ● WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. ● WHST.6-8.5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. ● WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. ● WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. ● WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. ● WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. ● WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Science	**1. Asking scientific questions & defining engineering problems**

Practices (SP)	2. Developing & using models 3. Planning & carrying out investigations **4. Analyzing & interpreting data** 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions **7. Engaging in argument from evidence** 8. Obtaining, evaluating, and communicating information
Assessment Alignment	**Minor Assessments** ● Monster Project ● Quiz **Major Assessments** ● Lab Report ● Natural Selection in 1 minute ● Unit Test
Honors Assignments	● Explain what's happening in the mitochondria and the chloroplast ● What are the nucleic acids? ● Reading about one genetic mutation ● How does protein synthesis happen? ● Co-dominant alleles and sex-linked traits ● Prediction about the results of natural selection as climate change happens
20 Key Vocabulary Words	Genes, mutations, proteins, asexual reproduction, sexual reproduction, chromosomes, nucleus, allele, Punnett squares, natural selection, variation, adaptation, artificial selection

Prior knowledge that students have entering this unit
1. Characteristics of living things (from 6th) 2. Basic understanding of organelles and their functions (from 6th) 3. Knowledge of cell theory--limited (from 6th) 4. Understanding of interspecies interactions, including the impacts of resource availability (from 7th)

Where this knowledge goes next
1. Meiosis and mitosis in more depth (biology) 2. Punnett squares with two factor crosses (biology) 3. Foundation of genetics (biology)

Descriptive outline narrative of unit
The unit begins in the domain *From Molecules to Organisms: Structures and Processes*. Students will differentiate between environmental and genetic factors that influence growth. They will plan an investigation to determine the effects of resource availability on individual growth. This experiment will be monitored in the classroom over the course of the unit, and students will do a lab write-up about it at the end of the Life Science Unit. The next couple weeks are spent on the *Heredity* domain, studying genes and inheritance patterns. Students will be expected to describe organisms using vocabulary including *genotype, phenotype, trait,* and *allele.* This part of the unit will include the Monster Project, where students use Punnett Squares and probability to create a fictional family. After looking at the big picture of genetics we will go to the molecular level, breaking apart and building DNA models. Students then compare and contrast sexual and asexual reproduction. We close out the unit with natural and artificial selection.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	LS1	8.MS-LS1-5	RST6-8.9	SWBAT differentiate between environmental and genetic factors that cause differing growth rates in organisms.	(S): When given an oral description in pairs, students identify the factor using the vocabulary: *Environmental*, *genetic*	SP2: developing & using models
2	LS2	8.MS-LS1-5	RST6-8.1	SWBAT analyze data of different growth rates in similar organisms to write a scientific question and hypothesis.	(W): Write a hypothesis using the sentence frame: *If the amount of sunlight the plant receives _____,*	SP4: analyzing & interpreting data

					then the plant will _____, because plants _____ _____.	
3	LS3	8.MS-LS1-5	RST6-8.3	SWBAT plan an investigation to determine the effects of resource availability on plant growth.	(W): Write the steps for an investigation.	SP3: planning & carrying out investigations
4	LS4	8.MS-LS1-5	RST6-8.3	SWBAT set up an investigation to determine the effects of resource availability on plant growth.	(R): Follow a written procedure precisely.	SP3: planning & carrying out investigations
5	LS5	8.MS-LS3-4	RST6-8.7	SWBAT use a simulation to show that each parent passes traits to its offspring.	(S): Describe individuals using the vocabulary: *offspring, trait.*	SP2: developing & using models
6	LS6	8.MS-LS3-4	RST6-8.7	SWBAT use a computer simulation to explain that one allele may be dominant over another.	(W): Describe the mouse simulation using the vocabulary: *homozygous dominant, homozygous recessive, allele, heterozygous.*	SP4: analyzing & interpreting data
7	LS7	8.MS-LS3-4	RST6-8.3	SWBAT use Punnett Squares to model simple inheritance patterns.	(W): Describe the probability that an offspring will have a given trait using the sentence frame: *There is a _____ percent chance that an offspring will be _____ for this trait.*	SP5: using mathematics & computational thinking
8	LS8	8.MS-LS3-4	WHST6-8.7	SWBAT use Punnett Squares to create fictional families.	(S): Describe the offspring in the fictional families using the vocabulary: *Phenotype, genotype, homozygous, heterozygous*	SP8: obtaining, evaluating and communicating information
9	LS9	8.MS-LS3-4	WHST6-8.4	SWBAT use models to explain in writing why multiple phenotypes are	(W): Explain in 2-3 sentences using the vocabulary: *Punnett*	SP2: developing & using models

				possible in the offspring of a pair of individuals.	*Square*, *genotype, dominant, recessive*	
10	LS10	8.MS-LS3-3	WHST6-8.4	SWBAT use a physical model to illustrate that chromosomes are made of long strands of DNA containing many distinct genes.	(S): Describe model of the nucleus using the vocabulary: *chromosome, DNA, gene, nucleotide.*	SP2: developing & using models
11	LS11	8.MS-LS3-3	RST6-8.7	SWBAT use physical models of DNA to show that each gene holds instructions for the production of specific proteins.	(R): Decode messages written on DNA strands to determine an organism's traits.	SP4: analyzing & interpreting data
12	LS12			SWBAT show mastery of Life Science concepts and vocabulary.	(W): Explain scientific concepts using the vocabulary learned in the life sciences unit.	SP8: obtaining, evaluating and communicating information
13	LS13	8.MS-LS3-2	RST6-8.7	SWBAT use diagrams to show how genetic information is passed on in asexual reproduction.	(R): Use a legend to interpret a diagram.	SP2: developing & using models
14	LS14	8.MS-LS3-4	WHST6-8.4	SWBAT use diagrams to show how genetic information is passed on in sexual reproduction.	(S): Describe a diagram using the vocabulary: mitosis, meiosis, prophase, anaphase, metaphase, telophase.	SP8: obtaining, evaluating and communicating information
15	LS15	8.MS-LS3-4	WHST6-8.4	SWBAT use diagrams to explain in writing why body cells contain a pair of each chromosome while sex cells contain one of each chromosome.	(W): Explain using the frames: *Cells that contain pairs of each ____ are called ____. There are two chromosomes because _____. Cells that contain one of each ____ are called ____. There is one chromosome because _____.*	SP2: developing & using models
16	LS16	8.MS-LS3-2	RST6-8.2	SWBAT compare and contrast the advantages and disadvantages of sexual and asexual reproduction.	(W): Compare using the sentence frames: *Asexual and sexual reproduction are similar...*	SP6: constructing scientific explanations

17	LS17	8.MS-LS3-3	RST6-8.7	SWBAT justify the claim that individuals in a species carry similar genetic information.	(W) Explain using the vocabulary *chromosome, genes, traits.*	SP7: engaging in argument from evidence
18	LS18	8.MS-LS4-4	WHST6-8.4	SWBAT use a computer simulation to model the process of natural selection.	(R) : Follow a written procedure to complete the computer simulation	SP5: using mathematics & computational thinking
19	LS19	8.MS-LS4-4	WHST6-8.4	SWBAT predict the traits that lead to greater reproductive success in a given scenario.	(s): Make predictions using the frames: *I think the ____ will have greater reproductive success because ___.*	SP2: developing & using models
20	LS20	8.MS-LS4-4	RST6-8.1	SWBAT orally explain why some traits are adapted by organisms over time.	(S): Explain using the vocabulary: *reproductive success, probability, trait.*	SP6: constructing scientific explanations
21	LS21	8.MS-LS4-5	WHST6-8.4	SWBAT explain how humans have impacted the inheritance of traits through artificial selection.	(W): Explain using the vocabulary *natural selection, artificial selection, adaptation.*	SP6: constructing scientific explanations
22	LS22	8.MS-LS1-5	WHST6-8.1	SWBAT construct an evidence-based argument for how environmental and genetic factors influence growth.	(R): Use an informational text to find evidence that environmental and genetic factors influence growth.	SP7: engaging in argument from evidence
23	LS23	8.MS-LS1-7	RST6-8.10	SWBAT justify the claim that living organisms need energy to grow and reproduce.	(W): Using the paragraph frame: *Living organisms need _____.*	SP7: engaging in argument from evidence
24	LS24	8.MS-LS1-7	WHST6-8.4	SWBAT use models to show that food molecules are broken down to release energy.	(R): Use a legend to interpret a diagram.	SP2: developing & using models

Subject	PS8
Unit	Unit 3: Physical Sciences
Est. Length	20 lessons (Jan-Mar)
Big Idea	The changes in and interactions between substances are determined by the types of atoms they are composed of. An object's movement is determined by the forces acting on it.
Essential Questions	1. How are molecules created and changed? 2. How is mass conserved during a chemical reaction? 3. What causes an object to move or stay in motion?
MA State Standards *Power standards in bold	**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, 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. 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. 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. 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 is not expected in state assessment. 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. 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.
Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. ● RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 6 - 8. ● RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. ● RST.6-8.6: Analyze the author's purpose in providing an explanation describing a procedure, or discussing an experiment in text.

	● RST.6.8-7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). ● RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. ● RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. ● RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. Writing ● WHST.6-8.1: Write arguments focused on *discipline-specific content*. ○ WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. ○ WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. ○ WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. ○ WHST.6-8.1.D: Establish and maintain a formal style. ○ WHST.6-8.1.E: Provide a concluding statement or section that follows from and supports the argument presented. ● WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. ○ WHST.6-8.2.A: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. ○ WHST.6-8.2.B: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. ○ WHST.6-8.2.C: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. ○ WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic. ○ WHST.6-8.2.E: Establish and maintain a formal style and objective tone. ○ WHST.6-8.2.F: Provide a concluding statement or section that follows from and supports the information or explanation presented. ● WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. ● WHST.6-8.5: With some guidance and support from peers and adults, develop and strengthen writing as

	needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. ● WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. ● WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. ● WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. ● WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. ● WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Science Practices (SP)	**1. Asking scientific questions & defining engineering problems** 2. Developing & using models 3. Planning & carrying out investigations **4. Analyzing & interpreting data** 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions **7. Engaging in argument from evidence** 8. Obtaining, evaluating, and communicating information
Assessment Alignment	**Minor Assessments** ● Quiz 3.1 ● Mini Lab Report **Major Assessments** ● Complete Lab Report ● Unit test
Honors Assignments	● Periodic table ● Valence electrons ● Balancing equations ● Atomic mass

20 Key Vocabulary Words	Atom, compound, molecule, mixture, pure substance, conservation of mass, intrinsic, extrinsic, chemical change, physical change, property, density, mass, volume, homogenous, heterogeneous, reactant, product, force, vector, scalar

Prior knowledge that students have entering this unit

1. Students have an understanding (likely not technical) of the concepts of mass, volume, and even density.
2. Students also have a limited understanding of atoms and molecules.
3. They are familiar with a few chemical compounds (i.e. H_2O).

Where this knowledge goes next

The first part of the unit lays the foundation for high school chemistry. In chemistry students will go more in depth on each of the topics we cover. In this unit there is a tension between the depth we have time for and the misconceptions this is likely to create in a discipline that follows laws that don't make sense with only surface understanding.
The second part of the unit lays the foundation for high school physics, where students will use some of the basic knowledge learned in this unit on more complex situations.

Descriptive outline narrative of unit

Students begin the unit by modeling matter. This unit explores the interactions between atoms, which requires a basic understanding of the different representations of atoms and molecules. Students will practice translating between 3D models, drawings, and chemical formulas, with a focus on a few common elements and molecules. Vocabulary to master: atom, element, compound, molecule. This part of the unit may also involve students becoming familiar with group roles.

Here we complicate the models, introducing pure substances vs homogeneous and heterogeneous mixtures. This will be done with the three different representations students practiced earlier, as well as with some physical examples like water, sugar water, and oil on water. While examining mixtures students will also determine whether chemical reaction has occurred or not, focusing on using intrinsic and extrinsic properties as evidence. After discovering that mixtures do not involve chemical reactions that rearrange

the configuration of atoms, we will move on to actual chemical reactions. We will continue to use various models to show chemical reactions. We will culminate with a lab where students explore the conservation of matter. They will design the procedure, execute the procedure, analyze their data, and do a second iteration to gather more data. The lab write up will be a major assessment in this unit.

The last part of the unit is focused on physics. Students will learn Newton's laws of motion and practice applying them through calculations and reading graphs.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	PS1	8.MS-PS1-1	RST6-8.4	SWBAT use models to identify the protons, neutrons and electrons in an oxygen atom.	(R): Read the periodic table to identify the atomic number and mass that can be used to determine the subatomic particles of an oxygen atom. *New Vocabulary: Element, atom, proton, neutron, electron*	SP2: DEVELOPING & USING MODELS
2	PS2	8.MS-PS1-1	RST6-8.7	SWBAT use models and the Periodic Table to identify elements based on their symbols.	(W): Justify in 1 - 2 sentences the identification of elements on the periodic table. *New Vocabulary: periodic table, atomic number*	SP2: DEVELOPING & USING MODELS
3	PS3	8.MS-PS1-1	WHST6-8.4	SWBAT describe in writing that atoms come together to form simple compounds and molecules.	(W): Describe a substance as an atom, a molecule and/or a compound. *New vocabulary: compound, molecule*	SP6: CONSTRUCTING SCIENTIFIC EXPLANATIONS
4	PS4	8.MS-PS1-1	RST6-8.4	SWBAT describe in writing how atoms come together to form simple compounds and molecules.	(W): Describe in 3-5 sentences why oxygen is more likely to bond with hydrogen than carbon.	SP6: CONSTRUCTING SCIENTIFIC EXPLANATIONS

					No new vocabulary	
5	PS5	8.MS-PS1-1	RST6-8.3	SWBAT use models to show that mixtures are composed of different proportions of pure substances.	(W): Describe a mixture in writing using the vocabulary: *heterogeneous, homogeneous.* *New vocabulary: pure substance, mixture, heterogeneous, homogeneous*	SP2: DEVELOPING & USING MODELS
6	PS6	8.MS-PS1-2	WHST6-8.9	SWBAT compare and contrast the intrinsic and extrinsic properties of oxygen and carbon.	(S): Discuss the properties of oxygen and carbon with a partner using the vocabulary: *atom, intrinsic, extrinsic.* *New Vocabulary: Intrinsic, extrinsic*	SP1: ASKING SCIENTIFIC QUESTIONS
7	PS7	8.MS-PS1-3	WHST6-8.9	SWBAT use a computer model to predict the effects of cooling and heating on a pure substance.	(S): Work with partner to describe the impacts of cooling and heating on a pure substance. *Review vocabulary from ESS: thermal energy*	SP5: USING MATHEMATICS & COMPUTATIONAL THINKING
8	PS8	8.MS-PS1-2	WHST6-8.7	SWBAT measure three extrinsic properties of a substance.	(R): Follow a written procedure to determine the color, mass, and volume of a given substance. *New vocabulary: mass, volume*	SP8: OBTAINING, EVALUATING AND COMMUNICATING INFORMATION
9	PS9	8.MS-PS1-2	WHST6-8.7	SWBAT determine the density of a substance.	(R): Follow a written procedure to determine the density of given substances. *Review vocabulary from ESS: density*	SP3: PLANNING & CARRYING OUT INVESTIGATIONS
10	PS10	8.MS-PS1-2	WHST6-8.7	SWBAT identify a substance based on intrinsic properties and justify their choice.	(W): Justify in 3-5 sentences the identity of a given substance from an investigation.	SP6: CONSTRUCTING SCIENTIFIC EXPLANATIONS

					No new vocabulary.	
11	PS11	8.MS-PS1-2	RST6-8.1	SWBAT interpret data on the color and temperature of a substance to determine whether a chemical reaction has occurred.	(W): Justify in 3-5 sentences whether a chemical reaction has occurred based on visual observations. *New vocabulary: chemical reaction*	SP7: ENGAGING IN ARGUMENT FROM EVIDENCE
12	PS12	8.MS-PS1-5	WHST6-8.7	SWBAT plan an experiment to demonstrate that mass is conserved in chemical reactions.	(W): Outline a 10 step procedure to demonstrate the law of conservation of mass. *New vocabulary: conservation of mass*	SP3: PLANNING & CARRYING OUT INVESTIGATIONS
13	PS13	8.MS-PS1-5	RST6-8.3	SWBAT conduct an experiment and collect data about conservation of mass.	(R): Follow a written procedure to conduct an experiment about the conservation of mass. *New vocabulary: none*	SP3: PLANNING & CARRYING OUT INVESTIGATIONS
14	PS14	8.MS-PS1-5	WHST6-8.5	SWBAT analyze data and replan an experiment to show that mass is conserved in chemical reactions.	(W): Describe data using the sentence starter: *This data shows...* *New vocabulary: none*	SP4: ANALYZING & INTERPRETING DATA
15	PS15	8.MS-PS1-5	WHST6-8.5	SWBAT conduct a second experiment to collect data about conservation of mass during chemical reactions.	(R): Follow a written procedure to conduct an experiment about the conservation of mass. *New vocabulary: none*	SP3: PLANNING & CARRYING OUT INVESTIGATIONS
16	PS16	8.MS-PS1-5	WHST6-8.10	SWBAT write a draft of a lab report about conservation of mass.	(W): Write a draft of a lab report using a graphic organizer. *New vocabulary: none*	SP4: ANALYZING & INTERPRETING DATA
17	PS17	8.MS-PS1-5	WHST6-8.10	SWBAT revise a lab report about conservation of mass.	(W): Revise a draft of a lab report using teacher feedback. *New vocabulary: none*	SP8: OBTAINING, EVALUATING AND COMMUNICATING INFORMATION

18	PS18	8.MS-PS2-2	RST6-8.7	SWBAT interpret position vs. time graphs to determine an object's velocity and acceleration.	(S): Work with a partner to read data on a graph and describe an object's velocity. *New vocabulary: velocity*	SP5: USING MATHEMATICS & COMPUTATIONAL THINKING
19	PS19	8.MS-PS2-2	RST6-8.7	SWBAT identify the types of forces acting on an object.	(W): Identify in writing the types of forces acting on an object. *New vocabulary: force, friction, applied force*	SP4: ANALYZING & INTERPRETING DATA
20	PS20	8.MS-PS2-2	RST6-8.9	SWBAT use free body diagrams to determine whether an object's velocity will change.	(W): Describe the net force on an object using the sentence frame: *The net force is _____.* *New vocabulary: net force, Newton's First Law*	SP5: USING MATHEMATICS & COMPUTATIONAL THINKING
21	PS21	8.MS-PS2-2	WHST6-8.4	SWBAT use Newton's second law to predict whether the acceleration of an object is positive, negative, or zero.	(W): Write claim and evidence statements about whether an object's acceleration is positive, negative, or zero. *New vocabulary:* Newton's Second Law	SP5: USING MATHEMATICS & COMPUTATIONAL THINKING
22	PS22	8.MS-PS2-2	WHST6-8.4	SWBAT explain how the inertia of an object is related to the mass of an object.	(W): Explain in writing how the larger an object is, the more influence mass has on its movement. *New vocabulary: inertia, Newton's first law*	SP6: CONSTRUCTING SCIENTIFIC EXPLANATIONS
23	PS23	8.MS-PS2-2	RST6-8.3	SWBAT provide evidence that changing an object's speed depends on its mass and the sum of the forces on an object.	(W): Use evidence to justify the claim that changing an object's speed depends on its mass and the sum of the forces on the object. *New vocabulary: none*	SP4: ANALYZING & INTERPRETING DATA
24	PS24	8.MS-	RST6-8.	SWBAT demonstrate Newton's third	(S): Work with a partner to	SP2: DEVELOPING & USING

		PS2-1	3	law that objects exert equal and opposite forces on each other.	describe how two objects push on each other. *New vocabulary: Newton's third law, force*	MODELS
25	PS25	8.MS-PS2-1	RST6-8.7	SWBAT apply Newton's third law to solve math problems involving collisions.	(R): Read word problems to find key information and calculate net force. *New vocabulary: none*	SP5: USING MATHEMATICS & COMPUTATIONAL THINKING

Subject	PS8
Unit	Unit 4: Technology and Engineering
Est. Length	8 lessons (Mar-Apr)
Big Idea	Materials are increasingly manufactured by computers and materials maintain their properties unless their chemical structure is altered.
Essential Questions	1. What causes a material's properties to change? 2. What are the advantages and disadvantages of computer-controlled manufacturing?
MA State Standards *Power standards in bold	**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. **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.
Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. ● RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 6 - 8. ● RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. ● RST.6-8.6: Analyze the author's purpose in providing an explanation describing a procedure, or discussing an experiment in text. ● RST.6.8-7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). ● RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. ● RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. ● RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. Writing ● WHST.6-8.1: Write arguments focused on *discipline-specific content*. ○ WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. ○ WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. ○ WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. ○ WHST.6-8.1.D: Establish and maintain a formal style. ○ WHST.6-8.1.E: Provide a concluding statement or section that follows from and supports the argument presented. ● WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

	○ WHST.6-8.2.A: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. ○ WHST.6-8.2.B: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. ○ WHST.6-8.2.C: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. ○ WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic. ○ WHST.6-8.2.E: Establish and maintain a formal style and objective tone. ○ WHST.6-8.2.F: Provide a concluding statement or section that follows from and supports the information or explanation presented. ● WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. ● WHST.6-8.5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. ● WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. ● WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. ● WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. ● WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. ● WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Science Practices (SP)	**1. Asking scientific questions & defining engineering problems** 2. Developing & using models 3. Planning & carrying out investigations **4. Analyzing & interpreting data** 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions **7. Engaging in argument from evidence**

	8. Obtaining, evaluating, and communicating information
Assessment Alignment	**Minor Assessment:** ● Quiz 4.1 **Major Assessment:** ● Tool Project
Honors Assignments	None
20 Key Vocabulary Words	Composition, sanding, rigid, elastic, assembly, quality control, hardness, brittleness, heat conductivity, forming, conditioning

Prior knowledge that students have entering this unit
1. XX 2. XX 3.

Where this knowledge goes next
1. XX

Descriptive outline narrative of unit

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)

1	ETS1	8.MS-ETS2-4	WHST6-8.4	SWBAT to describe the material properties of metal, wood, and plastic using engineering vocabulary.		SPX:
2	ETS2	8.MS-ETS2-4	RST6-8.1	SWBAT use evidence to justify the claim that physical alterations leave a material's properties unchanged.		
3	ETS3	8.MS-ETS2-4	RST6-8.3	SWBAT use evidence to determine which processes change a material's properties.		
4	ETS4	8.MS-ETS2-5	WHST6-8.4	SWBAT describe in writing manufacturing processes including forming, conditioning, assembling, finishing, quality control, and safety.		
5	ETS5	8.MS-ETS2-5	WHST6-8.4	SWBAT use manufacturing processes to produce a small tool.		
6	ETS6	8.MS-ETS2-5	RST6-8.10	SWBAT use an informational text to research the manufacturing processes that go into making cell phones.		
7	ETS7	8.MS-ETS2-5	RST6-8.9	SWBAT compare the advantages of human vs computer control of manufacturing processes.		

Subject	PS8
Unit	Unit 5: MCAS Review
Est. Length	12 lessons (April-May)
Big Idea	Students will review topics Earth Science, Life Science, and Physical Sciences.
Essential Questions	1. What knowledge and skills do we need to be successful on the MCAS?
MA State Standards *Power standards in bold	N/A
Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. ● RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 6 - 8. ● RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. ● RST.6-8.6: Analyze the author's purpose in providing an explanation describing a procedure, or discussing an experiment in text. ● RST.6.8-7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). ● RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. ● RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. ● RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text

	complexity band independently and proficiently. Writing ● WHST.6-8.1: Write arguments focused on *discipline-specific content*. ○ WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. ○ WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. ○ WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. ○ WHST.6-8.1.D: Establish and maintain a formal style. ○ WHST.6-8.1.E: Provide a concluding statement or section that follows from and supports the argument presented. ● WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. ○ WHST.6-8.2.A: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. ○ WHST.6-8.2.B: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. ○ WHST.6-8.2.C: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. ○ WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic. ○ WHST.6-8.2.E: Establish and maintain a formal style and objective tone. ○ WHST.6-8.2.F: Provide a concluding statement or section that follows from and supports the information or explanation presented. ● WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. ● WHST.6-8.5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. ● WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. ● WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

	● WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. ● WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. ● WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Science Practices (SP)	**1. Asking scientific questions & defining engineering problems** 2. Developing & using models 3. Planning & carrying out investigations **4. Analyzing & interpreting data** 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions **7. Engaging in argument from evidence** 8. Obtaining, evaluating, and communicating information
Assessment Alignment	MCAS exam
Honors Assignments	Attending MCAS Review
20 Key Vocabulary Words	Gravity, land formation, weathering, air pressure, waxing, waning, biodiversity, sexual reproduction, asexual reproduction, circulatory system, physical property, magnitude, kinetic energy, thermal energy

Prior knowledge that students have entering this unit
Everything in this unit is assumed to be prior knowledge.

Where this knowledge goes next

The focus of this unit is reviewing content for the purpose of doing well on the MCAS. However, I'm hoping to use these review days to also practice important scientific skills: interpreting data and supporting claims with evidence. These two skills should be useful both on the exam and in all future science classes.

Descriptive outline narrative of unit

Every day will have 3-5 simple facts students should know about the given topic (ex: The Earth is between the moon and sun during a lunar eclipse). Students will do a few simple exercises to internalize those facts, and then move towards understanding the broader concepts around the day's topic by interpreting data (practicing reading graphs and tables) and justifying claims with evidence. I am hoping this scaffolding will help avoid the typical review day problem of half of students being overwhelmed by things they think they never learned, and the other half being bored reviewing topics they know well already. The 12 topics we will cover are: gravity, moons, Earth's structure, climate & weather, evolution, heredity, photosynthesis & respiration, cell parts, food webs, conservation of energy & mass, forces & bridges, EDP. Exit tickets on review days will not be open note; they will quiz students on each of the day's facts and one interpreting evidence question. Students who receive accommodations will be pushed to memorize the most important facts and asked to focus on interpreting fewer diagrams at greater depth.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	R1	8.MS-ESS1-2	RST.6-8.1	SWBAT explain in writing gravity's role in the formation and motion of planets.	(W): Justify the claim that gravity plays a role in the formation and motion of planets.	SP6: Constructing scientific explanations
2	R2	6.MS-ESS1-1a	RST.6-8.3	SWBAT use models to show how and why the moon changes phase.	(R): Read a procedure to complete a modeling activity.	SP2: Developing & using models
3	R3	7.MS-ESS2-2	RST.6-8.4	SWBAT use diagrams to show how Earth's surface has changed over time.	(S): Work with a partner to match images of landscapes to the description of events that formed them.	SP4: Analyzing & interpreting data
4	R4	8.MS-	RST.6-8	SWBAT use weather data to explain	(R): Interpret diagrams to predict	SP2: Developing & using models

		ESS	.7	global weather patterns and long-term climate.	weather and climate outcomes.	
5	R5	6.MS-LS1-3	WHST.6-8.1.B	SWBAT justify the claim that species have evolved over time.	(W): Justify the claim that a certain species will best survive in a given environment.	SP7: Engaging in argument from evidence
6	R6	7.MS-LS2-3	RST.6-8.4	SWBAT predict the relative frequencies of offspring phenotypes.	(R): Find important information in a word problem to determine the phenotypes of parents and offspring.	SP5: Using mathematics & computational thinking
7	R7	8.MS-LS3-2	WHST.6-8.7	SWBAT explain the importance of photosynthesis and cellular respiration in living organisms.	(W): Predict the effects of limiting reactants in photosynthesis and cellular respiration.	SP4: Analyzing & interpreting data
8	R8	6.MS-PS1-8	WHST.6-8.4	SWBAT explain the importance of organelles and macromolecules in cells.	(W): Justify the claim that removing a specific organelle or macromolecule would inhibit a cell's ability to function.	SP6: Constructing scientific explanations
9	R9	7.MS-LS2-3	RST.6-8.4	SWBAT use food webs to explain how biodiversity influences an ecosystem's strength.	(R): Read a diagram to find evidence justifying the claim that an ecosystem's strength is dependent on its biodiversity.	SP2: Developing & using models
10	R10	7.MS-PS2-3	WHST.6-8.1.B	SWBAT justify the claim that mass and energy are conserved.	(W): Write an evidence statement justifying the claim that mass and energy are conserved when given a graph, table or description.	SP7: Engaging in argument from evidence
11	R11	8.MS-PS1-4	RST.6-8.2	SWBAT determine which forces are acting on a structure.	(W): Use evidence to justify a claim that a specific bridge type is best for a given situation.	SP8: Obtaining, evaluating, & communicating information
12	R12	8.MS-	WHST.6	SWBAT identify parts of the	(R): Identify each part of the	SP2: Developing & using models

		LS3-2	-8.7	Engineering Design Process.	EDP in a reading about one engineer's experience.	