Diocese of Greensburg Curriculum
Science Grade 8

Unit	Standards	Content	Skills
Structure and Properties of Matter	**CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12** **CCSS: Grades 6-8** **Reading: Science & Technical Subjects** **Key Ideas and Details** **1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.** RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts. **3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.** RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **Integration of Knowledge and Ideas** **7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.** 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). **CCSS: Mathematics** **CCSS: Grade 8** **Expressions & Equations** **8.EE.A. Work with radicals and integer exponents.** 8.EE.A.3. Use numbers expressed in the form of a single digit times a whole-number power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. **NGSS: Science Performance Expectations (2013)** **NGSS: MS Physical Science** **MS.Structure and Properties of Matter** **Performance Expectations**	• Atoms make up molecules. • There are physical and chemical properties that can be used to identify matter. • There are four types of matter: solid, liquid, gas, and plasma. • There are characteristics to states of matter. • Change of state involves energy. • Models of matter are used to describe and predict the 3 states of matter. • Scientific notation	The students will be able to: • Draw or create a Bohr's model and an electron cloud model • Distinguish between physical and chemical properties • Describe the atomic nature of the 4 states of matter • Complete simulation of the 4 states of matter • Design 3-D models of the elements

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	MS-PS1-1.Develop models to describe the atomic composition of simple molecules and extended structures. MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. **MS.Chemical Reactions** **Performance Expectations** 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. MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. **MS.Energy** **Performance Expectations** MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. 		
Chemical Reactions	**CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12** **CCSS: Grades 6-8** **Reading: Science & Technical Subjects** **3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.**	• Elements are arranged in order of increasing atomic mass and similar properties on the periodic table. • Chemical bonding is the joining of atoms to form new substances (ionic, covalent, and metallic bonds).	The students will be able to: • Decode and label the periodic table according to element properties and groupings. • Experiment and predict what will occur in

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	RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **Integration of Knowledge and Ideas** **7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.** 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). **Writing** **Research to Build and Present Knowledge** **7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.** 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. **8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.** 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. **CCSS: Mathematics** **CCSS: Grade 8** **Expressions & Equations** **8.EE.A. Work with radicals and integer exponents.** 8.EE.A.3. Use numbers expressed in the form of a single digit times a whole-number power of 10 to estimate very	• Chemical reactions can be predicted by placement on the periodic table. • Substances react chemically in characteristic ways. • Chemical reactions are endothermic or exothermic. • Original substances are regrouped to form different molecules with different properties. • Chemical reactions result in the conservation of matter and mass • Chemical reactions produce new substances.	chemical reactions labs and categorize reactions as endothermic or exothermic. • Model the atomic structure of the regrouping of different molecules and atoms into new substances. • Complete labs to demonstrate the conservation of matter and mass.

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	large or very small quantities, and to express how many times as much one is than the other. **Mathematical Practice** **MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.** MP.2. Reason abstractly and quantitatively MP.4. Model with mathematics **NGSS: Science Performance Expectations (2013)** **NGSS: MS Physical Science** **MS.Structure and Properties of Matter** **Performance Expectation** MS-PS1-1.Develop models to describe the atomic composition of simple molecules and extended structures. MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. **MS.Chemical Reactions** **Performance Expectations** 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. MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*		

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	MS.Energy **Performance Expectations** MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. 		
Electricity and Magnetism	**CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12** **CCSS: Grades 6-8** **Reading: Science & Technical Subjects** **Key Ideas and Details** **1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.** RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts. **3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.** RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **Writing**	• Electric and magnetic forces can be attractive and repulsive. • Force depends on the magnitude of the charges, current, magnetic strength and distance between objects. • Gravitational forces are always attractive. • A gravitational force is present between any two objects and is proportionate to mass. • Forces that act at a distance can be explained by fields that extend through space.	The students will be able to: • Experiment with static charges and their interactions. • Make an electroscope. • Experiment with conductors and insulators. • Construct parallel and series circuits with energy source, wires, and loads and switches. • Experiment with various sizes of batteries, wire gauge, and resistors to understand resistance and short circuits. • Calculate resistance using Ohm's law. • Calculate electric power. • Calculate electric energy.

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	Text Types and Purposes **1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.** WHST.6-8.1. Write arguments focused on discipline-specific content. **Research to Build and Present Knowledge** **7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.** 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. **CCSS: Mathematics** **CCSS: Grade 8** **Mathematical Practice** **MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.** MP.2. Reason abstractly and quantitatively. **NGSS: Science Performance Expectations (2013)** **NGSS: MS Physical Science** **MS.Forces and Interactions** **Performance Expectations** MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.		• Explore properties of magnets using various sizes and shapes of magnets. • Draw and label the magnetic fields surrounding our Earth. • Generate a magnetic field from an electric current. • Create an electromagnet. • Generate current from a changing magnetic field and explain how a generator works. • Research, create a visual, and share the process of producing electricity and delivering it to homes.

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	MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. 		
Motion and Stability: Forces and Interactions	**CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12** **CCSS: Grades 6-8** **Reading: Science & Technical Subjects** **Key Ideas and Details** **1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.** RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts. **3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.** RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **Writing** **Research to Build and Present Knowledge** **7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.**	• Forces act on objects. • The motion of an object is determined by the sum of the forces acting on it. • Newton's Laws of Motion quantify forces and motion.	The students will be able to: • Graph coordinates for the motion of an object based on position. • Differentiate between positive and negative direction. • Design models that illustrate various types of motions. • Calculate average acceleration. • Determine net force. • Recognize that friction can be helpful and harmful. • Experiment with ways to reduce friction. • Calculate change in velocity. • Cite examples of projectile motion. • Experiment with the three Laws of Motion.

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	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. **CCSS: Mathematics** **CCSS: Grade 8** **Mathematical Practice** **MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.** MP.2. Reason abstractly and quantitatively. **NGSS: Science Performance Expectations (2013)** **NGSS: MS Physical Science** **MS.Forces and Interactions** **Performance Expectations** MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.* MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. **MS.Energy** **Performance Expectations**		• Apply Newton's Laws to the motion of objects. • Calculate momentum.

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	MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. 		
Waves and Their Applications	**CCSS: English Language Arts 6-12** **CCSS: Grade 8** **Speaking & Listening** **5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.** SL.8.5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. **CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12** **CCSS: Grades 6-8** **Reading: Science & Technical Subjects** **Key Ideas and Details** **1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.** RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.	• The two main types of waves are transverse and longitudinal. • Waves have repeating patterns. • The properties of waves are amplitude, frequency, and length. • Types of wave interactions are reflection, refraction, and diffraction. • Sound waves have properties and need a medium for transmission. • Light can be reflected, absorbed, and transmitted. • Light travels in a straight line dependent upon the medium through which it travels.	The students will be able to: • Diagram the motion of a transverse and longitudinal wave and label the wave properties. • Conduct experiments on reflection, refraction, and diffraction. • Conduct experiments that will illustrate sound waves traveling through different mediums. • Model what happens to a wave when there are changes in pitch, frequency, loudness, and amplitude. • Simulate the Doppler Effect. • Research the electromagnet spectrum

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	2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. 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. **9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.** 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. **Writing** **9. Draw evidence from literary or informational texts to support analysis, reflection, and research.** WHST.6-8.9. Draw evidence from informational texts to support analysis reflection, and research. **CCSS: Mathematics** **CCSS: Grade 8** **Functions** **8.F.A. Define, evaluate, and compare functions.** 8.F.A.3. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. **Mathematical Practice** **MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.** MP.2. Reason abstractly and quantitatively. MP.4. Model with mathematics. **NGSS: Science Performance Expectations (2013)** **NGSS: MS Physical Science** **MS.Waves and Electromagnetic Radiation**		and create a visual presentation to share. • Conduct experiments to model the interactions of light waves: reflection, refraction, absorption, and scattering.

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	Performance Expectations MS-PS4-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. MS-PS4-3. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. **NGSS: Disciplinary Core Ideas** **NGSS: 6-8** **PS4: Waves and Their Applications in Technologies for Information Transfer** **PS4.A: Wave Properties** A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1) A sound wave needs a medium through which it is transmitted. (MS-PS4-2) **PS4.B: Electromagnetic Radiation** When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-2) The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (MS-PS4-2) A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS4-2) However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2)		

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	PS4.C: Information Technologies and Instrumentation Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3) 		
Science Projects	**CCSS: English Language Arts 6-12** **CCSS: Grade 7** **Capacities of the Literate Individual** **Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language** They build strong content knowledge. They comprehend as well as critique. They use technology and digital media strategically and capably. **Reading: Literature** **Key Ideas and Details** **1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.** RL.7.1. Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. **Writing** **Text Types and Purposes** **1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.** W.7.1d. Establish and maintain a formal style.	• The engineering design process • Inquiry based approach to the scientific method. • Scientific method • Hypothesis • Procedure • Background information • Procedures • Bibliography • Dependent and independent variables	The students will be able to: • Follow the scientific method to conduct an experiment. • Define the criteria and constraints of a scientific problem. • Research scientific principles. • Evaluate solutions to determine how well the objectives were met during the scientific process. • Analyze and interpret data to determine similarities and differences in findings. • Develop and use models. • Ask and define questions to specify relationships between variables. • Manage a project and meet deadlines. • Communicate project findings through written results, creating a presentation board, and speeches.

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	W.7.1e. Provide a concluding statement or section that follows from and supports the argument presented. **2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.** W.7.2. Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. W.7.2d. Use precise language and domain-specific vocabulary to inform about or explain the topic. **Production and Distribution of Writing** **4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.** W.7.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.) **6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.** W.7.6. Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources. **Research to Build and Present Knowledge** **7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.** W.7.7. Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.		

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	9. Draw evidence from literary or informational texts to support analysis, reflection, and research. W.7.9. Draw evidence from literary or informational texts to support analysis, reflection, and research. **Speaking & Listening** **Comprehension and Collaboration** **1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.** SL.7.1a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. **Presentation of Knowledge and Ideas** **4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.** SL.7.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation. **5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.** SL.7.5. Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. **Language** **Conventions of Standard English** **1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.**		

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	L.7.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. **2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.** L.7.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L.7.2b. Spell correctly. **Knowledge of Language** **3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.** L.7.3. Use knowledge of language and its conventions when writing, speaking, reading, or listening. L.7.3a. Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.* **CCSS: Mathematics** **CCSS: Grade 7** **The Number System** **7.NS.A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.** 7.NS.A.3. Solve real-world and mathematical problems involving the four operations with rational numbers. **Statistics & Probability** **7.SP.B. Draw informal comparative inferences about two populations.** 7.SP.B.4. Use measures of center and measures of variability for numerical data from random samples to		

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	draw informal comparative inferences about two populations. **7.SP.C. Investigate chance processes and develop, use, and evaluate probability models.** 7.SP.C.6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. **Mathematical Practice** **MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.** MP.6. Attend to precision. **NGSS: Science Performance Expectations (2013)** **NGSS: MS Engineering Design** **MS.Engineering Design** **Performance Expectations** MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object,		

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	tool, or process such that an optimal design can be achieved.. **NGSS: Crosscutting Concepts** **NGSS: 6-8** **Crosscutting Statements** **1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.** Graphs, charts, and images can be used to identify patterns in data. **2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.** Cause and effect relationships may be used to predict phenomena in natural or designed systems. Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. **3. Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.** Scientific relationships can be represented through the use of algebraic expressions and equations. **7. Stability and Change – For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.** Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales, including the atomic scale.		

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	Connections to the Nature of Science: Most Closely Associated with Crosscutting Concepts **Science is a Way of Knowing** Science is both a body of knowledge and the processes and practices used to add to that body of knowledge. **Science Addresses Questions About the Natural and Material World.** Science limits its explanations to systems that lend themselves to observation and empirical evidence. **NGSS: Disciplinary Core Ideas** **NGSS: 6-8** **ETS1: Engineering Design** **ETS1.C: Optimizing the Design Solution** Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design. (MS-ETS1-3 (secondary to MS-PS1-6) The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MSETS1-4) (secondary to MS-PS1-6) 		