MCS MMS Physical Science Advanced Content Subject Group Overview

Unit Name	Properties of Matter	Atomic Structure & Periodic Table	Principles of Atomic Bonding	Chemical Reactions	Solutions, Acids, and Bases	Nuclear Chemistry	Energy	Forces & Motion	Waves	Electricity & Magnetism
Time Frame	3.5 Weeks	4 Weeks	3 Weeks	3 Weeks	3.5 Weeks	3 weeks	3 Weeks	4 Weeks	3 Weeks	3 Weeks
Standards	SPS5.a., b. SPS7. d.	SPS1.a., b., c.	SPS1.a. SPS2.a., b., c.	SPS3. a., b.	SPS6.a., b., c., d., e.	SPS1.a SPS4. a., b., c.	SPS7.a., b., c.	SPS8.a., b., c., d.	SPS9.a., b., c., d., e.	SPS10. a., b., c.
Gifted Standards	S1A, S1B, S4A	S2A, S4D, S2D	S1C, S2B, S2D, S5E	S4D, S6A, S2D	S1C, S2B, S2D, S5E	S4D, S4E	S3A, S3C, S5A, S6A,	S5B, S5C, S6C, S6D	S4B, S4C, S4E, S5D	S2C, S3B, S6E
Science & Engineering Practices	Science & Engineering Practices Students will: ● Ask questions to compare and contrast models depicting the particle arrangement and motion in solids, liquids, gasses, and plasma. ● Plan and carry out investigations to identify the relationships between temperature, pressure, volume, and density of gasses in closed systems. ● Analyze and interpret data to explain the flow of energy during phase changes using heating/cooling curves.	Science & Engineering Practices Students will: ● Develop and use models to compare and contrast the structure of atoms, ions, and isotopes. ● Analyze and interpret data to determine trends. ● Use the Periodic Table as a model to predict the above properties of main element groups.	Science & Engineering Practices Students will: ● Develop and use models to compare and contrast the structure of atoms, ions, and isotopes. ● Analyze and interpret data to predict properties of ionic and covalent compounds. ● Develop and use models to predict formulas for stable, binary ionic compounds based on balance of charges. ● Use the International Union of Pure and Applied	Science & Engineering Practices Students will: ● Plan and carry out investigations to generate evidence supporting the claim that mass is conserved during a chemical reaction. ● Develop and use a model of a chemical equation to illustrate how the total number of atoms is conserved during a chemical reaction.	Science & Engineering Practices Students will: ● Develop and use models to explain the properties (solute/solvent, conductivity, and concentration) of solutions. ● Plan and carry out investigations to determine how temperature, surface area, and agitation affect the rate solutes dissolve in a specific solvent. ● Analyze and interpret data from a solubility curve to determine the	Science & Engineering Practices Students will: ● Develop and use models to compare and contrast the structure of atoms, ions, and isotopes. ● Develop a model that illustrates how the nucleus changes as a result of fission and fusion. ● Use mathematics and computational thinking to explain the process of half-life as it relates to radioactive decay.	Science & Engineering Practices Students will: ● Construct explanations for energy transformations within a system. ● Plan and carry out investigations to describe how molecular motion relates to thermal energy changes in terms of conduction, convection, and radiation. ● Analyze and interpret specific heat data to justify the selection of a material for a practical	Science & Engineering Practices Students will: ● Plan and carry out an investigation to analyze the motion of an object using mathematical and graphical models. ● Construct an explanation based on experimental evidence to support the claims presented in Newton's three laws of motion. ● Analyze and interpret data to identify the relationship between mass and gravitational	Science & Engineering Practices Students will: ● Analyze and interpret data to identify the relationships among wavelength, frequency, and energy in electromagnetic waves and amplitude and energy in mechanical waves. ● Ask questions to compare and contrast the characteristics of electromagnetic and mechanical waves. ● Develop models based on experimental	Science & Engineering Practices Students will: ● Use mathematical and computational thinking to support a claim regarding relationships among voltage, current, and resistance. ● Develop and use models to illustrate and explain the conventional flow (direct and alternating) of current and the flow of electrons in simple series and parallel circuits. ● Plan and carry out investigations to determine the relationship between magnetism and

				Chemistry (IUPAC) nomenclature for translating between chemical names and chemical formulas.		effect of temperature on solubility. ● Obtain and communicate information to explain the relationship between the structure and properties (e.g., pH, and color change in the presence of an indicator) of acids and bases. ● Plan and carry out investigations to detect patterns in order to classify common household substances as acidic, basic, or neutral.	● Construct arguments based on evidence about the applications, benefits, and problems of nuclear energy as an alternative energy source.	application (e.g., insulators and cooking vessels).	force for falling objects. ● Use mathematics and computational thinking to identify the relationships between work, mechanical advantage, and simple machines.	evidence that illustrates the phenomena of reflection, refraction, interference, and diffraction. ● Analyze and interpret data to explain how different media affect the speed and sound of light waves. ● Develop and use models to explain the changes in sound waves associated with the Doppler effect.	the movement of electrical charge.

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	Approaches To Learning Instructional Strategies	**Self-Management: Organization:** Bring necessary equipment and supplies to class. **Communication:** Take effective notes in class.	**Communication:** Organize and depict information logically.	**Self-Management: Affective** Practice focus and concentration	**Communication:** Make inferences and draw conclusions.	**Critical Thinking:** Identify trends and forecast possibilities	**Critical Thinking:** Make logical, reasonable judgments and create arguments to support them.	**Critical Thinking:** Consider consequences to events.	**Research:** Collect and analyze data to identify solutions and/or make informed decisions. **Critical Thinking:** Use models and simulations to explore complex systems and issues.	**Communication:** Negotiate ideas and knowledge with peers and teachers.	**Collaboration:** Work effectively with others.
	Statement of Inquiry	Scientific and technical advancements have led to the development of models to make sense of changes in systems. **Phenomena**: How can we use our understanding of particle arrangement and Gas Laws to explain why certain objects can explode due to different temperatures or altitudes?	Scientific and technical advancements have enabled scientists to understand relationships and patterns that exist related to the structure and function of elements in our natural world. **Phenomena**: How can we use our understanding of the organization	Scientific and technical advancements have enabled scientists to understand the relationships and interactions between elements that are necessary for the creation of compounds. **Phenomena:** How can we use our understanding of ionic and covalent bonding to justify the use of sport drinks for athletes?	Scientific and technical innovations allow us to visualize, model, and explain the balanced changes that occur in systems of matter during chemical reactions. **Phenomenon**: How can we use our understanding of	Scientific and technical innovations use the relationships and interactions between substances to create new solutions and products with specific properties. **Phenomenon:** How can we use our understanding of solutions, acids, bases, and pH level to help pH	Scientific and technical innovations help us to model changes in the nuclei that can be harnessed as sources of energy. **Phenomena:** How can we use our understanding of fission and fusion to determine and	Scientific and technical innovations allow us to observe and measure thermal energy and the transfer of heat between systems in order to design products with desired features. **Phenomena:** How can our understanding of energy transformations and specific heat data impact the	Advances in science and technology have furthered humans' understanding of the relationship between forces, mass, and motion (velocity and acceleration) in systems. **Phenomena**: How can we use our understanding of Newton's Laws, Work, and Simple Machines to	Models allow us to examine patterns in wave behavior in order to identify relationships between energy, frequency, wavelength, and amplitude. **Phenomena**: How can we use our understanding of electromagnetic and mechanical waves to explain	Advances in science and technology have allowed humans to design systems that make use of the movement of electrons and harness the relationship between electricity and magnetism. **Phenomena:** How can we use our understanding of circuits, electrical current, and magnetism to develop an

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		CER: Students answer the phenomenon in a Claim-Evidence-Reasoning constructed response as a formative or summative assessment.	of the periodic table and atomic structure to determine an element's properties? **CER:** Students answer the phenomenon in a Claim-Evidence-Reasoning constructed response as a formative or summative assessment.	**CER:** Students answer the phenomenon in a Claim-Evidence-Reasoning constructed response as a formative or summative assessment.	chemical reactions and LOCOM to develop a flameless heating source for cooking? **CER:** Students answer the phenomenon in a Claim-Evidence-Reasoning constructed response as a formative or summative assessment.	be used to determine whether a wound is healing properly? **CER:** Students answer the phenomenon in a Claim-Evidence-Reasoning constructed response as a formative or summative assessment.	justify if nuclear power is a viable alternative energy source? **CER:** Students answer the phenomenon in a Claim-Evidence-Reasoning constructed response as a formative or summative assessment.	design and selection of products for everyday use? **CER:** Students answer the phenomenon in a Claim-Evidence-Reasoning constructed response as a formative or summative assessment.	evaluate the mechanical advantage of common tools? **CER:** Students answer the phenomenon in a Claim-Evidence-Reasoning constructed response as a formative or summative assessment.	how wave behaviors impact our ability to observe matter around us? **CER:** Students answer the phenomenon in a Claim-Evidence-Reasoning constructed response as a formative or summative assessment.	appropriate device for a given function? **CER:** Students answer the phenomenon in a Claim-Evidence-Reasoning constructed response as a formative or summative assessment.

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	Global Context	**Scientific and Technical Innovation** Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.	**Scientific and Technical Innovation** Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.	**Scientific and Technical Innovation** Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.	**Scientific and Technical Innovation** Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.	**Scientific and Technical Innovation** Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.	**Scientific and Technical Innovation** Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.	**Scientific and Technical Innovation** Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.	**Scientific and Technical Innovation** Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.	**Scientific and Technical Innovation** Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.	**Scientific and Technical Innovation** Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.

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	Key Concepts	**Systems and system models (MYP/CCC)** Systems are sets of interacting or interdependent components. Systems provide structure and order in human, natural and built environments. Systems can be static or dynamic, simple or complex.	**Relationships (MYP)** Relationships are the connections and associations between properties, objects, people and ideas - including the human community's connections with the world in which we live. Any change in a relationship brings consequences.	**Relationships (MYP)** Relationships are the connections and associations between properties, objects, people and ideas - including the human community's connections with the world in which we live. Any change in a relationship brings consequences.	**Systems and system models (MYP/CCC)** Systems are sets of interacting or interdependent components. Systems provide structure and order in human, natural and built environments. Systems can be static or dynamic, simple or complex.	**Relationships (MYP)** Relationships are the connections and associations between properties, objects, people and ideas - including the human community's connections with the world in which we live. Any change in a relationship brings consequences.	**Change (MYP/CCC)** Change is a conversion, transformation or movement from one form, state, or value to another. Inquiry into the concept of change involves understanding and evaluating causes, processes and consequences.	**Systems and system models (MYP/CCC)** Systems are sets of interacting or interdependent components. Systems provide structure and order in human, natural and built environments. Systems can be static or dynamic, simple or complex.	**Relationships (MYP)** Relationships are the connections and associations between properties, objects, people and ideas - including the human community's connections with the world in which we live. Any change in a relationship brings consequences.	**Relationships (MYP)** Relationships are the connections and associations between properties, objects, people and ideas - including the human community's connections with the world in which we live. Any change in a relationship brings consequences.	**Systems and system models (MYP/CCC)** Systems are sets of interacting or interdependent components. Systems provide structure and order in human, natural and built environments. Systems can be static or dynamic, simple or complex.
	Related Concepts	Transformation (MYP)	Patterns (MYP/CCC) Structure & Function (MYP/CC)	Interactions (MYP)	Balance (MYP)	Interactions (MYP)	Energy (MYP/CC) Models (MYP/CC)	Energy (MYP/CC) Transformation (MYP/CC)	Movement (MYP)	Models (MYP/CC)	Movement (MYP/CC)

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	Disciplinary Core Ideas	Connecting Core Ideas ● Atomic and molecular motion ● Heating/cooling curves ● Gas Laws	Connecting Core Ideas ● Structure of atoms and elements ● Periodic Table trends	Connecting Core Ideas ● Structure of atoms and elements ● Periodic Table trends ● Compounds: properties, bonds, and naming	Connecting Core Ideas ● Atomic and molecular motion ● Compounds: naming and writing formulas ● Conservation of matter	Connecting Core Ideas ● Solutions ● Acids and bases	Connecting Core Ideas ● Nuclear energy ● Fission and fusion ● Radioactive decay ● Energy transformations	Connecting Core Ideas ● Energy ● Thermal energy ● Heat ● Conduction, Convection, Radiation ● Specific Heat ● Energy transformations	Connecting Core Ideas ● Forces and motion ● Newton's Laws ● Simple Machines ● Gravitational force ● Energy ● Energy transformations	Connecting Core Ideas ● Electromagnetic and mechanical waves ● Reflection, refraction, interference, and diffraction ● Doppler effect ● Energy ● Energy Transformations	Connecting Core Ideas ● Electricity and magnetism ● Energy transformations
	MYP Assessments / Performance Tasks	**Common Assessments Title and Criterion:** Properties of Matter Unit Assessment Paper I and Paper II (Science: A,D) Lab: Investigating Density (Science: A,C,D) Lab: Investigating Gas Laws Using Syringes (Science: A,C,D)	**Common Assessments Title and Criterion:** Atomic Structure and Periodic Table Unit Assessment Paper I and Paper II (Science: A,D) Research: Analyzing PT Groups (Science: A,C,D) Elaboration: Investigating Mendeleev's Table (Science: A,C,D)	**Common Assessments Title and Criterion:** Principles of Atomic Bonding Unit Assessment Paper I and Paper II (Science: A,D) Lab: Elements vs. Compounds (Science: A, C,D) Lab: Mystery Substances Investigation (Science: A-D)	**Common Assessments Title and Criterion:** Chemical Reactions Unit Assessment Paper I and Paper II (Science: A, D) Lab: Investigating & Identifying Chemical Reactions (Science: A,C,D) Designing a Flameless	**Common Assessments Title and Criterion:** Solutions, Acids, and Bases Unit Assessment Paper I (Science: A,D) Lab: Factors that Affect Solubility (Science: A-D) Lab: Identifying Acids/Bases (Science: A-D)	**Common Assessments Title and Criterion:** Nuclear Chemistry Unit Assessment Paper I and Paper II (Science: A,D) Lab: Half-Life Simulation (Science: A-D) Debate: Nuclear Energy Debate (Science: A,D)	**Common Assessments Title and Criterion:** Energy Unit Assessment Paper I and Paper II (Science: A,D) Designing a Device for Rescue Workers (Design: A-D) Lab: Thermal Transfer (Science: A-D)	**Common Assessments Title and Criterion:** Forces & Motion Unit Assessment (Science: A,D) Lab: Exploring Motion Using Ticker Tape (Science: A,C,D) Work & Calculating Mechanical Advantage Unit Assessment (Science: A,D)	**Common Assessments Title and Criterion:** Waves Unit Assessment Paper I and Paper II (Science: A, D) Elaboration: Wave Behavior Scenarios (Science: A,D) Research: EM Spectrum Device Research Activity (Science: A,C,D)	**Common Assessments Title and Criterion:** Electricity & Magnetism Unit Assessment Paper I (Science: A,D) Designing An Electromagnet (Design: A-D)

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					Heating Unit (Design: A-D)				Lab: Calculating Mechanical Advantage Using Simple Machines (Science: A,C,D)		
	Differentiation For Tiered Learners	Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects