MMS Honors Science 8 Subject Group Overview

Unit Name	Atomic Structure, Periodic Table, & LOCOM	Classification & Properties of Matter	Energy Forms & Transformations	Thermal Energy & Phase Changes	Waves	Non-Contact Forces	Motion & Newton's Laws	Aviation Capstone
CAPSTONE Connective Theme	Elements in Flight	Sustainable Fuel Sources for Aviation	Energy Forms & Transformations in Aircraft	Effects of Temperature on Aircraft Performance	Aeronautical Applications of Waves	Magnetic, Electrical, & Gravitational Fields in Aviation	Forces in Flight	Science in Aviation: Curating A Collection for an Aviation Museum
Time Frame	5 Weeks	4 Weeks	4 weeks	4 Weeks	5 Weeks	4 Weeks	4 Weeks	3 Weeks
Standards	S8P1. c.,d.,e.	S8P1.a.,d.,f.	S8P2.a.,b.,c.	S8P1.b/S8P2.d	S8P4.a., b., c., d., e., f., g.	S8P5.a., b., c.	S8P3.a., b., c.	S8P1 - S8P5
Gifted Standards	S2A, S4D	S1C, S2B, S2D, S5E	S3A, S3C, S5A, S6A,	S1A, S1B, S4A	S4B, S4C, S4E, S5D	S2C, S3B, S6E	S5B, S5C, S6C, S6D	S1B, S1C, S4E, S6B
Science & Engineering Practices	Students will: ● Develop models (e.g., atomic level models, including drawings, and computer representations) by analyzing patterns within the periodic table that illustrate the structure, composition, and characteristics of atoms (protons, neutrons, electrons) and simple molecules. ● Plan and carry out investigations to compare and contrast chemical (i.e., reactivity, combustibility) and physical (i.e., density, melting point, boiling	Students will: ● Develop and use a model to compare and contrast pure substances and mixtures. ● Construct an argument based on observational evidence to support the claim that when a change in a substance occurs, it can be classified as either chemical or physical. ● Construct an explanation based on evidence to describe conservation of matter in a chemical reaction	Students will: ● Analyze and interpret data to create graphical displays that illustrate the relationships of kinetic energy to mass and speed and potential energy to mass and height of an object. ● Plan and carry out an investigation to explain the transformation between kinetic and potential energy within a system (e.g. roller coasters, pendulums, rubber bands, etc.). ● Construct an argument to support a claim about the type of energy transformations within a system [e.g., lighting a match	Students will: ● Develop and use models to describe the movement of particles in solids, liquids, gasses, and plasma states when thermal energy is added or removed. ● Plan and carry out investigations on the effects of heat transfer on molecular motion as it relates to the collision of atoms (conduction), through space (radiation), or in currents in a liquid or gas (convection).	Students will: ● Ask questions to develop explanations about the similarities and differences between electromagnetic and mechanical waves. ● Construct an explanation using data to illustrate the relationship between the electromagnetic spectrum and energy. ● Design a device to illustrate the practical applications of the electromagnetic spectrum (e.g., communication, medical, military). ● Develop and use a model to compare and contrast how light and sound waves are	Students will: ● Construct an argument using evidence to support the claim that fields (i.e., magnetic fields, gravitational fields, and electric fields) exist between objects exerting forces on each other even when the objects are not in contact. ● Plan and carry out investigations to demonstrate the distribution of charge in	Students will: ● Analyze and interpret data to identify patterns in the relationships between speed and distance, and velocity and acceleration. ● Construct an explanation using Newton's Laws of Motion to describe the effects of balanced and unbalanced forces on the motion of an object. ● Construct an argument from evidence to support the claim that the amount of force needed to accelerate an	Students will have the opportunity to engage in one or more of the following: ● Ask questions and define problems ● Develop and use models ● Plan and carry out investigations ● Use mathematics and computational thinking ● Construct explanations and design solutions ● Engage in arguments from evidence ● Obtain, evaluate, and communicate information

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		point) properties of matter. ● Construct an argument based on observational evidence to support the claim that when a change in a substance occurs, it can be classified as either chemical or physical.	including the resulting differences between products and reactants.	(light to heat), turning on a light (electrical to light).		reflected, refracted, absorbed, diffracted, or transmitted through various materials. ● Develop and use a model (e.g., simulations, graphs, illustrations) to predict and describe the relationships between wave properties (e.g., frequency, amplitude, and wavelength) and energy. ● Develop and use models to demonstrate the effects that lenses have on light (i.e. formation of an image) and their possible technological applications.	conductors and insulators. ● Plan and carry out investigations to identify the factors (e.g., distance between objects, magnetic force produced by an electromagnet with varying number of wire turns, varying number or size of dry cells, and varying size of iron core) that affect the strength of electric and magnetic forces.	object is proportional to its mass (inertia)	
	Approaches To Learning Instructional Strategies	**Critical Thinking:** Identify trends and forecast possibilities **Reflection:** Consider content: -What did I learn about today? -What don't I understand? -What questions do I have now?	**Communication:** Make inferences and draw conclusions. **Communication:** Negotiate ideas and knowledge with peers and teachers. **Research:** Collect and analyze data to identify solutions and/or make informed decisions.	**Self-Management: Organization:** Bring necessary equipment and supplies to class. **Self-Management: Affective:** Practice focus and concentration. **Research:** Collect and analyze data to identify solutions and/or make informed decisions.	**Communication:** Read critically and for comprehension. **Communication:** Take effective notes in class. **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. **Collaboration:** Work effectively with others. **Research:** Collect and analyze data to identify solutions and/or make informed decisions.	**Critical Thinking:** Make logical, reasonable judgments and create arguments to support them. **Social: Collaboration:** Delegate and take responsibility as appropriate. **Research:** Collect and analyze data	**Research:** Collect and analyze data to identify solutions and/or make informed decisions. **Critical Thinking:** Consider consequences to events. **Research:** Collect and analyze data to identify solutions	**Creative Thinking:** Generating novel ideas and considering new perspectives. Transfer skills: Combine knowledge, understanding and skills to create products or solutions. **Research:** Collect and analyze data to identify solutions and make informed decisions.

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							to identify solutions and/or make informed decisions.	and/or make informed decisions.	**Communication:** Collaborate with peers and experts using a variety of digital environments and media.
	Statement of Inquiry	Scientific and technical advancements enable scientists to understand relationships and patterns that exist related to the structure and function of elements in our natural world. **<u>Aviation Phenomena</u>**: How can the Periodic Table be used to determine characteristics of elements that are useful in flight?	Scientists and technical innovations allow us to visualize, model, and explain properties of and changes in systems of matter. **<u>Aviation Phenomenon:</u>** How can chemical or physical properties of pure substances and mixtures help identify sustainable fuel options for aircraft?	Scientific and technical advancements have led to the development of multiple systems that facilitate energy transformations. **<u>Aviation Phenomena</u>**: How do energy forms and transformations impact flight operations?	Scientific and technical innovations enable us to use thermal energy changes for practical applications. **<u>Aviation Phenomenon</u>:** How are planes designed and manufactured to withstand extreme temperature changes?	Advances in science and technology have developed humans' understanding of the uses, behaviors, and effects of electromagnetic and mechanical energy. **<u>Aviation Phenomena:</u>** How are the characteristics and properties of EM and mechanical waves applied in aeronautics?	Scientific and technical innovations allow us to understand the relationships between objects in magnetic, gravitational, and electric fields. **<u>Aviation Phenomena:</u>** How do magnetic, electrical, and gravitational fields support and/or impact aviation?	Scientific and technical advancements have led to the development of a variety of models that can be used to demonstrate changes in motion of balanced and unbalanced forces on objects. **<u>Aviation Phenomena:</u>** How is flight possible with Newton's Laws of Motion?	Scientific and technical innovations have enhanced the development of aviation by capitalizing on the relationships and interactions between chemistry, physics, and engineering. **<u>Aviation Phenomena:</u>** How can we use our mastery of core ideas in physical science to increase community engagement in our local aviation museum?
	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.

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	Key Concepts	**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.	**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.	**Development (MYP)** Development is the act or process of growth, progress or evolution, sometimes through iterative improvements.	**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.
	Related Concepts	Patterns (MYP/CCC)	Models (MYP)	Energy (MYP/CCC) Transformation (MYP)	Energy (MYP/CCC)	Effects (MYP)	Interaction (MYP)	Movement (MYP)	Interaction (MYP) Development (MYP)
	Disciplinary Core Ideas	<u>Connecting Core Ideas</u> ● Matter (structure, composition, properties) ● Chemical and Physical Properties and Changes ● Atomic Structure ● Periodic Table	<u>Connecting Core Ideas</u> ● Matter (structure, composition, properties) ● Mixtures and solutions ● Elements and compounds ● Conservation of Matter	<u>Connecting Core Ideas</u> ● Energy ● Energy Transformations ● Kinetic & Potential	<u>Connecting Core Ideas</u> ● Matter (structure, composition, properties) ● Thermal Energy ● States of Matter	<u>Connecting Core Ideas</u> ● Wave Properties (frequency, amplitude, wavelength, and energy) ● Energy (electromagnetic spectrum) ● Light and Sound ● Wave Propagation (reflection, refraction, absorption, diffraction, transmission) ● Lenses	<u>Connecting Core Ideas</u> ● Forces (friction, gravitational, electrical, and magnetic) ● Force fields ● Conductors and insulators	<u>Connecting Core Ideas</u> ● Energy ● Kinetic and Potential ● Force and Motion ● Speed and Distance ● Speed and Acceleration ● Newton's Laws of Motion ● Balanced and Unbalanced Forces	<u>Connecting Core Ideas</u> ● Energy ● Matter ● Waves ● Fields ● Forces & Motion

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	MYP Assessments / Performance Tasks	**Common Assessments Title and Criterion:** Atomic Structure & Periodic Table Unit Assessment Paper I (Science: A,D) Lab: Observing & Using Physical & Chemical Properties and Changes (Science: A,C, D) Elements on the Periodic Tablet (Science A,C,D)	**Common Assessments Title and Criterion:** Classification & Properties of Matter Unit Assessment Paper I and Paper II (Science: A,D) Designing a Filtration System for Clean Water (Design: A-D) Lab: Investigating Density (Science: A,C,D) DE: Boeing Future U: Boeing 360 Experience: Sustainable Aviation (Science: A,D)	**Common Assessments Title and Criterion:** Energy Forms and Transformations Unit Assessment Paper I (Science: A,D) Lab/SIM: Ball Drop (Science: B-D) MYP Aviation Energy Design Challenge (Design: A-D)	**Common Assessments Title and Criterion:** Thermal Energy & Phase Changes Unit Assessment Paper I and Paper II (Science: A,D) Lab: Investigating Boiling Ice Lab (Science: B,C) Lab/SIM: Exploring Thermal Energy Transfer Between Various Materials (Science: A-D)	**Common Assessments Title and Criterion:** Waves Unit Assessment Paper I (Science: A,D) Lab: Elaborating on Wave Properties (Science: A,B,C,D) Lab: Investigating Wave Behaviors (Science: A,C,D) Lab: Investigating Lenses (Science: A,C,D) Research: Electromagnetic Spectrum in Aviation (Science: A,D)	**Common Assessments Title and Criterion:** Non-Contact Forces Unit Assessment Paper I and Paper II (Science: A,D) Design an Electromagnet (Design: A-D) Lab: Investigating Electrostatics (Science: B,C) Research: Investigating the Impact of Non-Contact Forces in Flight (Science: A,D)	**Common Assessments Title and Criterion:** Motion & Newton's Laws Unit Assessment Paper I (Science: A,D) DE: Boeing Future U: Boeing 360 Experience: Flight Path/Forces of Flight Experience (Science: B,C) Lab: Using Spring Scales to Measure Force (Science: B,C)	**Common Assessments Title and Criterion:** Culminating Capstone Product/Presentation MYP Science A.i. MYP Science D.i. - iv. MYP Design A.ii. MYP Design B.i., iii., iv. MYP Design C.i.-v. MYP Design D.ii., iii., iv.
	Differentiation For Tiered Learners	Capstone Connections Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners	Capstone Connections Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners	Capstone Connections Discovery Education Science Techbook Discovery Education: Boeing Future U	Capstone Connections Discovery Education Science Techbook	Capstone Connections Discovery Education Science Techbook NGSS Case Studies for Differentiated Learners	Capstone Connections Discovery Education Science Techbook	Capstone Connections Discovery Education Science Techbook Discovery Education: Boeing Future U	Culminating Capstone Product/Presentation Choice of Aviation Museum Product

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		NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	Discovery Education: Boeing Future U NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	NGSS Case Studies for Differentiated Learners NGSS: All Standards, All Students Extensions - Enrichment Tasks/Projects	
	Capstone Elements	Capstone Kickoff -Introduction to Design Cycle -Introduction to Honors Science 8 Capstone Capstone Brainstorming Aviation Periodic Table	Capstone Brainstorming & Idea Selection Capstone Experience: Marietta Aviation History & Technology Center Lab/SIM: Exploring Thermal Energy Transfer Between Various Materials CER: Forms of Heat Transfer in Flight	Capstone Idea Submission Capstone Idea Feedback MYP Aviation Energy Design Challenge	Capstone Experience: Delta Flight Museum Final Capstone Idea Submission Capstone Research DE: Boeing Future U: Boeing 360 Experience: Sustainable Aviation	Capstone Action Plan Proposal (Sections A-D) Capstone Action Plan Feedback Electromagnetic Spectrum in Aviation	Capstone Action Plan Proposal (Sections E-G) Capstone Action Plan Feedback Capstone Product Work Research: Investigating the Impact of Non-Contact Forces in Flight	Capstone Product Work DE: Boeing Future U: Boeing 360 Experience: Flight Path/Forces of Flight Experience	Culminating Capstone Product & Presentations Capstone Showcase