AERO NGSS ALIGNMENT BY PEROFRMANCE EXPECTATIONS (NGSS) PERFORMANCE INDICATORS (AERO)

5 to 8

Physical Science

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
PS1.A: Structure and Properties of Matter	Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). MS-PS1-1 Develop models to describe the atomic composition of simple molecules and extended structures.	Properties of matter	PS.1.8A: By the end of Grade 8, students when given graphic or written information will be able to classify matter as atom/molecule or element/compound (Not the structure of an atom).	Explain that all matter is composed of minute particles called atoms; and explain that all substances are composed of atoms, each arranged into different groupings Identify elements as substances that contain only one kind of atom and explain that elements do not break down by normal laboratory reactions, such as heating, exposure to electric current, and reaction to acid. Use models or diagrams to show the difference between atoms and molecules. Given graphic or written information, classify matter as an atom / molecule or element/ compound (not the structure of an atom).
		Properties of matter	PS.1.8B: By the end of Grade 8, students will explain how properties of elements and the location of elements on the periodic table are related.	Describe how elements can combine to form new substances that often have different properties Demonstrate with atomic models (e.g., ball and stick) how atoms can combine in a large number of ways to form a molecule or formula unit (crystal).

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PS1.A: Structure and Properties of Matter	**Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.** 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-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	Properties of matter	PS.1.8C: By the end of Grade 8, students will be able to use physical and chemical properties as determined through an investigation to identify a substance.	Identify substances by their physical and chemical properties, such as magnetism, conductivity, density, solubility, boiling and melting points. Identify elements according to their common properties, such as highly reactive metals, less reactive metals, highly reactive non-metals and almost non-reactive gases Separate substances based on their physical properties (e.g., density, magnetism, light transmission, density, luster, malleability, solubility, ductility, boiling point, freezing point, conductivity, flammability) and identify a molecule as the smallest part of a substance that retains its properties Given data about characteristic properties of matter (e.g., melting and boiling points, density, solubility, acid or base), identify, compare, or classify different substances.
		Properties of matter	PS.1.8B: By the end of Grade 8, students will explain how properties of elements and the location of elements on the periodic table are related.	Differentiate between a mixture and a pure substance. Describe the different atoms and molecules in mixtures (e.g., dissolving carbon dioxide in water produces a type of mixture [solution] of CO_2 and H_2O molecules). Demonstrate how mixtures can be separated by using the properties of the

				substances from which they are made, such as particle size, density, solubility and boiling point
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PS1.A: Structure and Properties of Matter	**Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.** 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-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	**Properties of matter**	**PS.1.8E:** By the end of Grade 8, students will be able to investigate and explain the relationships among mass, volume and density.	Differentiate between weight and mass. Explain how different substances of equal volume usually have different weights Differentiate between volume and mass and calculate the density of large and small quantities of a variety of substances (e.g., aluminum foil, water, copper, clay, rock).
			PS.1.8B: By the end of Grade 8, students will explain how properties of elements and the location of elements on the periodic table are related.	Explain that over one hundred elements exist, and identify the periodic table as a tool for organizing the information about them. Explain that elements are organized in the periodic table according to their properties. Use the periodic table to obtain information about a given element Predict how an atom's electron arrangement influences its ability to transfer or share electrons and is related its position on the periodic table.

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PS1.A: Structure and Properties of Matter	Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. 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.	Properties of matter	PS.1.8D: By the end of Grade 8, students will represent or explain the relationship between or among energy, molecular motion, temperature, and states of matter	Create diagrams or models that represent the states of matter at the molecular level Explain that states of matter depend on the arrangement of the molecules and their motion.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
PS1.A: Structure and Properties of Matter	**The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.** 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	Properties of matter	PS.1.8D: By the end of Grade 8, students will represent or explain the relationship between or among energy, molecular motion, temperature, and states of matter	Predict the changes in the state of matter when adding or taking away heat (e.g., ice melting, water boiling or freezing, condensation/evaporation). Describe how matter changes from one phase to another (e.g., condensation, evaporation). Describe the movement of individual particles and verify the conservation of matter during the phase changes (e.g., melting, boiling, or freezing). Predict the effect of thermal energy on the physical properties of water as it changes to and from a solid, liquid, or gas (i.e., freezing/melting, evaporation/condensation). Explain the effect of increased and decreased thermal energy on the motion and arrangement of molecules. Observe the physical processes of evaporation and condensation, or freezing and melting, and describe these changes in terms of molecular motion and conservation of mass.
		Changes in Matter	PS.2.8A: By the end of Grade 8, students will demonstrate how	Describe how energy has the ability to create change.

			substances can chemically react with each other to form new substances having properties different from those of the original substances	
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PS1.B: Chemical Reactions	**Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.** 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-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. MS-PS1-5 Develop and use a model to describe how the total number of atoms does not change in a chemical reaction	**Changes in Matter**	**PS.2.8A:** By the end of Grade 8, students will demonstrate how substances can chemically react with each other to form new substances having properties different from those of the original substances.	Explain that oxidation involves combining oxygen with another substance, as in burning or rusting. Identify characteristics of chemical changes: (e.g. burning, production of a new substance, production of light, color change, endothermic and exothermic reactions, reactivity). Demonstrate how substances can react chemically with other substances to form new substances, known as compounds, and that in such re-combinations the properties of the new substances may be very different from those of the old. Identify the reactants and/or products in a chemical reaction Identify factors that affect reaction rates, such as temperature, concentration and surface area, and explain that dissolving substances in liquids often accelerates reaction rates.

	and thus mass is conserved.			Determine the effect of various factors on reaction rate (e.g., temperature, surface area, concentration, agitation).

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PS1.B: Chemical Reactions	**The total number of each type of atom is conserved, and thus the mass does not change.** 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.	Properties of matter	.PS.1.8B: By the end of Grade 8, students will explain how properties of elements and the location of elements on the periodic table are related. PS.1.8E: By the end of Grade 8, students will be able to investigate and explain the relationships among mass, volume and density.	Use data to infer or predict that the total amount of mass in a closed system stays the same, regardless of how substances interact (conservation of matter). Demonstrate that regardless of how parts of an object are arranged, the mass of the whole is always the same as the sum of the masses of its parts.
		Energy Transfer and Conservation	PS.4.8 D: By the end of Grade 8, students will collect data or use data provided to infer or predict that the total amount of mass in a closed system stays the same, regardless of how substances interact (conservation of matter).	Explain the relationship between the mass of an object and the sum of its parts Describe how mass remains constant in a closed system and provide examples relating to both physical and chemical change Explain the law of conservation of matter and energy.
PS1.B: Chemical Reactions	**Some chemical reactions release energy, others store energy.** MS-PS1-6 Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes	Changes in Matter	PS.2.8A: By the end of Grade 8, students will demonstrate how substances can chemically react with each other to form new substances having properties different from those of the original	Classify chemical reactions by energy type (e.g., endothermic and exothermic).

			substances.	

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PS2.A: **Forces and Motion**	**For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law).** MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects	**Motion at the Macroscopic Level** **Forces Affecting Motion**	**PS.5.8A:** By the end of Grade 8, students will measure distance and time for a moving object and using those values as well as the relationship s=d/t to calculate speed and graphically represent the data **PS.6.8A:** By the end of Grade 8, students will use data to determine or predict the overall (net effect of multiple forces (e.g., friction, gravitational, magnetic) on the position, speed, and direction of motion of objects.	Describe variables that change an object's speed, direction, or both and identify and describe the forces that cause the change in motion Describe Newton's Laws of Motion; identify examples, illustrate qualitatively and quantitatively drawing vector examples. Describe the relationship between the strength of a force on an object and the resulting effect, such as the greater the force, the greater the change in motion Use data to determine or predict the overall (net) effect of multiple forces (e.g., friction, gravitational, magnetic) on the position, speed, and direction of motion of objects.

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PS2.A: Forces and Motion	**The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion.** 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.	Forces Affecting Motion	PS.6.8A: By the end of Grade 8, students will use data to determine or predict the overall (net effect of multiple forces (e.g., friction, gravitational, magnetic) on the position, speed, and direction of motion of objects.	Use data to predict how a change in force (greater/less) might affect the position, direction of motion, or speed of an object (e.g., ramps and balls). Demonstrate that an object in motion that is unaffected by a force will continue to move at a constant speed and in a straight line. (Newton's First Law). Investigate and describe how the acceleration of a body is dependent on its mass and the net applied force (Newton's Second Law). Explain that when a force is applied to an object, it reacts in one of three ways: the object either speeds up, slows down, or goes in a different direction
	All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. 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	Motion at the Macroscopic Level	PS.5.8A: By the end of Grade 8, students will measure distance and time for a moving object and using those values as well as the relationship s=d/t to calculate speed and graphically represent the data	Explain motion in terms of frames of reference and analyze graphs depicting motion and predicted future motion Create a graph devised from measurements of moving objects and their interactions, including: position-time graphs and velocity-time graphs. Interpret the relationships of distance versus time, speed versus time, and acceleration versus time graphs. .

	mass of the object			
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PS2.B: Types of Interactions	**Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.** MS-PS2-3 Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.	**Forces Affecting Motion**	**PS.6.8A:** By the end of Grade 8, students will use data to determine or predict the overall (net effect of multiple forces (e.g., friction, gravitational, magnetic) on the position, speed, and direction of motion of objects.	Explain that just as electric currents can produce magnetic forces, magnets can cause electric currents
	Forces that act at a distance (electric and magnetic) can be explained by fields that extend through space and can be mapped by their effect on a test object (a ball, a charged object, or a magnet, respectively). 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	**ESS.4 Tectonics**	**SS.4.8A:** By the end of Grade 8, students will use geological evidence to support the idea that the Earth's crust/lithosphere is composed of plates that move. **ESS.4.8B:** By the end of Grade 8, students will describe how the magnetic	Compare Earth's magnetic field to the magnetic field of a magnet. Investigate the effects of magnets on the needle of a compass and compare this to the effects of Earth's magnetic field on the needle of a compass (e.g., magnets effect the needle only at close distances, Earth's magnetic field affects the needle at great distances). Construct a compass and explain how it works. using Earth's magnetic field.

	are not in contact.		field of Earth and a magnet are similar.	

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PS2.B: Types of Interactions	**Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.** 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.	Forces Affecting Motion	PS.6.8A: By the end of Grade 8, students will use data to determine or predict the overall (net effect of multiple forces (e.g., friction, gravitational, magnetic) on the position, speed, and direction of motion of objects.	Explain that the Earth's gravitational force pulls any object toward it. Explain the effect of gravity on falling objects (e.g., g= 9.8m/s^2, object dropped on earth and on moon). Explain that the force of gravity gets stronger the closer one gets to an object and decreases the further away one gets from it Predict the effect of gravitational forces between pairs of objects (i.e., earth and object's on the surface, earth and moon, Earth and sun).
		Earth and Space Science	ESS.1.8A By the end of Grade 8, students will describe the universe as containing many billions of galaxies, and each galaxy contains many billions of stars.	Explain that the sun's gravitational pull holds the Earth and other planets in their orbits, just as the planets' gravitational pull keeps their moons in orbit around them gravity is the force that governs the motion in the solar system. Explain through words, charts, diagrams, and models the effects of distance and the amount of mass on the gravitational force between objects.

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PS3.A: Definitions of Energy	The term "heat" as used in everyday language refers both to thermal motion (the motion of atoms or molecules within a substance) and radiation (particularly infrared and light). In science, heat is used only for this second meaning; it refers to energy transferred when two objects or systems are at different temperatures. secondary to MS-PS1-4 Temperature is not a measure of energy; the relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. secondary to MS-PS1-4	Forms of Energy	PS.3.8B: By the end of Grade 8, students will use data to draw conclusions about how heat can be transferred (convection, conduction, radiation).	Explain that energy, in the form of heat, is usually a by-product when one form of energy is changed to another, such as when machines convert stored energy to motion Describe how thermal energy (heat) is transferred by conduction, convection, and radiation, and how heat conduction differs in conductors and insulators. Explain how thermal energy (heat) consists of the random motion and vibrations of atoms and molecules and is measured by temperature.
	Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. 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	Energy Transfer and Conservation	PS.4.8A: By the end of Grade 8, students will show, given a real-world example, that within a system, energy transforms from one form to another (i.e., chemical, heat, electrical, gravitational, light, sound, mechanical).	Differentiate between kinetic energy, which is the energy of motion and potential energy, which depends on relative position. Compare the potential and kinetic energy within a system at various locations or times.

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PS3.A: Definitions of Energy	**A system of objects may also contain stored (potential) energy, depending on their relative positions.** 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.	Energy Transfer and Conservation	**PS.4.8A:** By the end of Grade 8, students will show, given a real-world example, that within a system, energy transforms from one form to another (i.e., chemical, heat, electrical, gravitational, light, sound, mechanical).	Describe how an object can have potential energy due to its position or chemical composition. Compare the potential and kinetic energy within a system at various locations or times
PS3.B: Conservation of Energy and Energy Transfer	**When the motion energy of an object changes, there is inevitably some other change in energy at the same time.** MS-PS3-5 Construct, use, and present arguments to support the claim that when the motion energy of an object changes, energy is transferred to or from the object. The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. 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	Energy Transfer and Conservation	**PS.4.8 D:** By the end of Grade 8, students will collect data or use data provided to infer or predict that the total amount of mass in a closed system stays the same, regardless of how substances interact (conservation of matter).	Explain that energy can change from one form to another (e.g., changes in kinetic and potential energy in a gravitational field, heats of reaction, hydroelectric dams) and that energy is conserved in these changes. Explain the law of conservation of matter and energy.

	measured by the temperature of the sample.			

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PS3.B: Conservation of Energy and Energy Transfer	**Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.** **Energy is spontaneously transferred out of hotter regions or objects and into colder ones.** MS-PS3-3, Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer 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.	Forms of Energy	PS.3.8B: By the end of Grade 8, students will use data to draw conclusions about how heat can be transferred (convection, conduction, radiation).	Explain how thermal energy (heat) flows in terms of the transfer of vibrational motion of atoms and molecules from hotter to colder regions.

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PS3.C: Relationship Between Energy and Forces	**When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.** 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	**Energy Transfer and Conservation**	**PS.4.8A:** By the end of Grade 8, students will show, given a real-world example, that within a system, energy transforms from one form to another (i.e., chemical, heat, electrical, gravitational, light, sound, mechanical).	Compare the following ways in which energy may be transformed: mechanical to electrical; electrical to thermal. Trace energy transformation in a simple closed system (e.g., a flashlight). Construct a model to explain the transformation of energy from one form to another. (e.g. an electrical circuit changing electrical energy to light energy in a light bulb, electrical energy to sound,, etc). Identify various ways in which electrical energy is generated using renewable and nonrenewable resources (e.g., wind, dams, fossil fuels, nuclear reactions).
PS3.D: Energy in Chemical Processes and Everyday Life	The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. secondary to MS-LS1-6 Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex	**Energy Transfer and Conservation**	**PS.4.8A:** By the end of Grade 8, students will show, given a real-world example, that within a system, energy transforms from one form to another (i.e., chemical, heat, electrical, gravitational, light, sound, mechanical).	Explain that chemical energy is produced by chemical reactions and is dependent upon the arrangements of atoms.

	molecules containing carbon react with oxygen to produce carbon dioxide and other materials. secondary to MS-LS1-7			
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PS4.A: Wave Properties	**A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.** 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.	**Energy Transfer and Conservation**	**PS.4.8B:** By the end of Grade 8, students will investigate, observe, and predict how energy might be transferred by means of waves.	Demonstrate that vibrations in materials may produce waves that spread away from the source in all directions (e.g., earthquake waves and sound waves. Explain that energy can be carried from one place to another by waves (e.g., water waves, sound waves), by electric currents, and by moving objects Explain that some energy travels as waves (e.g., seismic, light, sound), including: the sun as source of energy for many processes on Earth, different wavelengths of sunlight (e.g., visible, ultraviolet, infrared), vibrations of matter (e.g., sound, earthquakes), different speeds through different materials
	A sound wave needs a medium through which it is transmitted. MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials	**Forms of Energy**	**PS.3.8C:** By the end of Grade 8, students will describe sound as the transfer of energy through various materials (e.g. solids, liquids, gases).	Describe and summarize observations of the transmission, reflection, and absorption of sound. Observe and explain that sound vibrations move at different speeds, have different wavelengths; and establish wave-like disturbances that emanate from the source.

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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. 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. A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. However, because light can travel through space, it cannot be a matter wave, like sound or water waves. MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials	Forms of Energy	PS.3.8D: By the end of Grade 8, students will explain the effects on wavelength and frequency as electromagnetic waves interact with matter (e.g., light diffraction, blue sky).	Demonstrate that visible light from the sun or reflected by objects may be made up of a mixture of many different colors of light. Explain the relationship between an object's color and the wavelength of light reflected or transmitted to the viewer's eyes. Describe the relationship between frequency and wavelength of any wave. Differentiate between electromagnetic and mechanical waves and represent in diagrams, or other models the visible spectrum as a part of the electromagnetic spectrum (consisting of visible light, infrared, and ultraviolet radiation) and composed of all colors of light. Explain that the human eye can only detect wavelengths of electromagnetic radiation within a narrow range; and explain that the differences of wavelength within that range of visible light are perceived as differences in color.

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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-PS3-3, Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer			

Life Sciences

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS1.A: Structure and Function	**All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).** MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.	**Organization and Development**	**LS.1.8A:** By the end of Grade 8, students will describe or compare how different organisms have mechanisms that work in a coordinated way to obtain energy, grow, move, respond, provide defense, enable reproduction, or maintain internal balance (e.g., cells, tissues, organs and systems).	Describe the hierarchical organization of multicellular organisms from cells to tissues to organs to systems to organisms. Recognize and illustrate (e.g. flow chart) the structural organization of an organism from a cell to tissue to organs to organ systems to organisms.
			LS.1.8C: By the end of Grade 8, students will explain relation ships between or among the structure and function of the cells, tissues, organs, and organ systems in an organism.	Explore how the use of a microscope allows one to see cells in a variety of organisms. Explore how the use of a microscope allows one to see cells in a variety of organisms. Observe and describe (e.g., drawing, labeling) individual cells as seen through a microscope targeting cell membrane, cell wall, nucleus, and chloroplasts. Compare and contrast plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, cytoplasm,

				chloroplasts, mitochondria, vacuoles).
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LS1.A: Structure and Function	**Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.** MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.	**Organization and Development**	**LS.1.8A:** By the end of Grade 8, students will describe or compare how different organisms have mechanisms that work in a coordinated way to obtain energy, grow, move, respond, provide defense, enable reproduction, or maintain internal balance (e.g., cells, tissues, organs and systems).	Explain how each type of cell, tissue, and organ has a distinct structure and set of functions that serve the organism as a whole. Investigate, compare, and contrast the different structures of organisms that serve different functions for growth, reproduction, and survival. Explain how the cell, as the basic unit of life, has the same survival needs as an organism (i.e., obtain energy, grow, eliminate waste, reproduce, provide for defense). Investigate and describe how cells, grow, divide, and take in nutrients, which they use to provide energy for cellular functions. Explain the relationships between and amongst the specialized structures of the cell and their functions (e.g. transport of materials, energy transfer, waste disposal, information feedback, and even movement).
		Organization and Development	**LS.1.8B:** By the end of Grade 8, students will use a model, classification system, or dichotomous key to illustrate, compare, or interpret possible relationships among groups	~~Follow a taxonomic key to identify a given organism (e.g. flowering and non-flowering plants).~~ ~~Sort organisms with similar characteristics into groups based on internal and external structures.~~

			of organisms (e.g., internal and external structures, anatomical features).	~~Classify organisms into the currently recognized kingdoms according to characteristics that they share. Be familiar with organisms from each kingdom~~.

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LS1.A: Structure and Function	**Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.** MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.	**Organization and Development**	**LS.1.8C:** By the end of Grade 8, students will explain relation ships between or among the structure and function of the cells, tissues, organs, and organ systems in an organism.	Explain the functions of the cell (e.g., growth, metabolism, reproduction, photosynthesis, response). Explain that within cells, many of the basic functions of organisms (e.g., extracting energy from food and getting rid of waste) are carried out. The way in which cells function is similar in all living organisms. Explain that specialized cells perform specialized functions. (e.g., muscle cells contract, nerve cells transmit impulses, and skin cells provide protection).

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LS1.A: Structure and Function	**In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.** MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells	**Organization and Development**	**LS.1.8A:** By the end of Grade 8, students will describe or compare how different organisms have mechanisms that work in a coordinated way to obtain energy, grow, move, respond, provide defense, enable reproduction, or maintain internal balance (e.g., cells, tissues, organs and systems).	Identify the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, excretion, protection from disease, and movement, control, and coordination) and describe ways that these systems interact with each other. Describe structures or behaviors that help organisms survive in their environment (e.g., defense, obtaining nutrients, reproduction, and eliminating waste). Identify and contrast the structures of plants and animals that serve similar functions (e.g., taking in water and oxygen, support, response to stimuli, obtaining energy, circulation, digestion, excretion, reproduction).
			LS.1.8C: By the end of Grade 8, students will explain relation ships between or among the structure and function of the cells, tissues, organs, and organ systems in an organism.	Compare individual cells of tissues and recognizing the similarities of cells and how they work together to perform specific functions.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS1.A: Structure and Function	**In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.** MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells	**Matter and Energy Transformations**	**LS.2.8A:** By the end of Grade 8, students will use data and observations to make connections between, to explain, or to justify how specific cell organelles produce/regulate what the cell needs or what a unicellular or multi-cellular organism needs for survival.	Explain that most multicellular organisms have specialized cells to survive, while unicellular organisms perform all survival functions. (e.g. nerve cells communicate with other cells, muscle cells contract, unicellular are not specialized). Identify various specialized cells and common unicellular organisms in diagrams, photographs and/or microscopic slides. Describe the common life processes necessary to the survival of organisms (i.e., growth, reproduction, life span, response to stimuli, energy use, exchange of gases, use of water, elimination of waste).

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS1.B: Growth and Development of Organisms	**Animals engage in characteristic behaviors that increase the odds of reproduction.** **Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.** MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	Heredity and Reproduction	LS.4.8A: By the end of Grade 8, students will compare and contrast sexual reproduction with asexual reproduction	Explain that an individual organism does not live forever; therefore reproduction is necessary for the continuation of every species and traits are passed on to the next generation through reproduction. Explain reproduction as a fundamental process by which the new individual receives genetic information from parent(s).
LS1.B: Growth and Development of Organisms	**Genetic factors as well as local conditions affect the growth of the adult plant.** MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.			

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS1.C: Organization for Matter and Energy Flow in Organisms	**Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.** MS-LS1- 6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	Organization and Development	LS.1.8A: By the end of Grade 8, students will describe or compare how different organisms have mechanisms that work in a coordinated way to obtain energy, grow, move, respond, provide defense, enable reproduction, or maintain internal balance (e.g., cells, tissues, organs and systems).	Describe the importance of the transport and exchange of oxygen and carbon dioxide to the survival of the organism. Explain that oxygen is needed by all cells of most organisms for the release of energy from nutrient (sugar) molecules. Describe photosynthesis as a chemical change with reactants (water and carbon dioxide) and products (energy-rich sugar molecules and oxygen) that takes place in the presence of light and chlorophyll.
		Interdependence	LS.3.8A: By the end of Grade 8, students will describe how the environment and interactions between organisms can affect the number of species and the diversity of species in an ecosystem.	Identify the sun as the major source of energy for life on earth and sequence the energy flow in an ecosystem. Describe the basic processes and recognize the substances involved in photo-synthesis and respiration Explain the transfer of the sun's energy through living systems and its effect upon

				them. .

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS1.C: Organization for Matter and Energy Flow in Organisms	**Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy.** MS-LS1-7 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism	Interdependence	LS.3.8A: By the end of Grade 8, students will describe how the environment and interactions between organisms can affect the number of species and the diversity of species in an ecosystem.	Describe the basic processes and recognize the names and chemical formulas of the substances involved in photo-synthesis and respiration
LS1.D: Information Processing	**Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.** MS-LS1- 8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.			

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS2.A: Interdependent Relationships in Ecosystems	**Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.** MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	Interdependence	LS.3.8A: By the end of Grade 8, students will describe how the environment and interactions between organisms can affect the number of species and the diversity of species in an ecosystem.	Identify the biotic factors (populations of organisms) and abiotic factors (e.g., quantity of light and water, range of temperatures, soil composition) that make up an ecosystem. Explain the factors that affect the number and types of organisms an ecosystem can support, including available resources, abiotic and biotic factors and disease Identify ways organisms interact with one another in various ways besides providing food. Describe the factors related to matter and energy in an ecosystem that both influence fluctuations in population size and determine the carrying capacity of a population

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS2.A: Interdependent Relationships in Ecosystems	In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. Growth of organisms and population increases are limited by access to resources MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	Matter and Energy Transformations	LS.2.8B: By the End of Grade 8, students will trace the flow of energy through an ecosystem	Classify populations of unicellular and multicellular organisms as producers, consumers, and decomposers by the role they serve in the ecosystem Describe how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within a food chain from producers (plants) to consumers to decomposers. Explain how energy is transferred through food chains and food webs in an ecosystem Explain how the amount of useable energy available to organisms decreases as it passes through a food chain and/or food web Explain that the total amount of matter in a closed system remains the same as it is transferred between organisms and the physical environment even though its location or form changes. Compare and contrast predator/prey, parasite/host and producer/consumer/decomposer relationships.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS2.A: Interdependent Relationships in Ecosystems	Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	Interdependence	LS.3.8A: By the end of Grade 8, students will describe how the environment and interactions between organisms can affect the number of species and the diversity of species in an ecosystem.	Identify populations within a community that are in competition with one another for resources Predict the possible effects of removing an organism from a food chain. Predict the possible effects of changes in the number and types of organisms in an ecosystem on the populations of other organisms within that ecosystem.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS2.B: Cycle of Matter and Energy Transfer in Ecosystems	Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	Matter and Energy Transformations	LS.2.8B: By the End of Grade 8, students will trace the flow of energy through an ecosystem	Differentiate between the three types of consumers (herbivore, carnivore, omnivore). Diagram and describe the transfer of energy in an aquatic food web and a land food web with reference to producers, consumers, decomposers, scavengers, and predator/prey relationships.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS2.C: Ecosystem Dynamics, Functioning, and Resilience	**Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.** MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	Interdependence	LS.3.8A: By the end of Grade 8, students will describe how the environment and interactions between organisms can affect the number of species and the diversity of species in an ecosystem.	Predict and analyze how a change in an ecosystem, resulting from natural causes, changes in climate, human activity or introduction of invasive species, can affect both the number of organisms in a population and the biodiversity of species in the ecosystem.
LS2.C: Ecosystem Dynamics, Functioning, and Resilience	**Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.** MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	Evolution and Diversity	LS.5.8A: By the end of Grade 8, students will cite examples supporting the concept that certain traits of organisms may provide a survival advantage in a specific environment and therefore, an increased likelihood to produce offspring	Explain how a population's or species' traits affect their ability to survive over time. Describe possible causes for the extinction of an animal or plant. Cite evidence that demonstrates evolutionary relationships among organisms (e.g., similarities in body structure, early development, traits). Explain how natural selection leads to evolution (e.g., survival of the fittest).

NGSS	**Progression 6 to 8**	**AERO**	**Benchmark 6 to 8**	**AERO Performance Indicators**
LS4.D: Biodiversity and Humans	**Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling.** MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services	**Evolution and Diversity**	**LS.5.8A:** By the end of Grade 8, students will cite examples supporting the concept that certain traits of organisms may provide a survival advantage in a specific environment and therefore, an increased likelihood to produce offspring	Give examples of how organisms can cause changes in their environment to ensure survival and explain how some of these changes may affect the ecosystem.
LS1.B: Growth and Development of Organisms	**Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.** (secondary to MS- LS3-2)	**Heredity and Reproduction**	**LS.4.8A:** By the end of Grade 8, students will compare and contrast sexual reproduction with asexual reproduction	Describe forms of asexual reproduction that involve the genetic contribution of only one parent (e.g., binary fission, budding, vegetative propagation, regeneration). Describe sexual reproduction as a process that combines genetic material of two parents to produce a new organism (e.g., sperm/egg, pollen/ova).

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS3.A: Inheritance of Traits	Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.	Heredity and Reproduction	LS4.8B: By the end of Grade 8, Students will using data to provide evidence that supports the concept that genetic information is passed on from both parents to offspring	Identify that genetic material (i.e. chromosomes and genes) is located in the cell's nucleus.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS3.A: Inheritance of Traits	Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.	Heredity and Reproduction Evolution and Diversity	LS4.8B: By the end of Grade 8, Students will using data to provide evidence that supports the concept that genetic information is passed on from both parents to offspring LS.5.8A: By the end of Grade 8, students will cite examples supporting the concept that certain traits of organisms may provide a survival advantage in a specific environment and therefore, an increased likelihood to produce offspring	Explain that characteristics of an organism result from inherited traits of one or more genes from the parents and others result from interactions with the environment. Differentiate between inherited and acquired traits. Observe, record and compare differences in inherited traits (e.g. connected earlobe, tongue rolling). Explain that some animal behaviors are instinctive (e.g., turtles burying their eggs), and others are learned (e.g., humans building fires for warmth). Explain that many plants and animals can survive harsh environments because of seasonal behaviors, e.g., in winter, some trees shed leaves, some animals hibernate, and other animals migrate. Differentiate between observed characteristics of plants and animals that are fully inherited (e.g., color of flower, shape of leaves,) and characteristics that are affected by the climate or environment (e.g., browning of leaves).

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS3.A: Inheritance of Traits	In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.	Heredity and Reproduction	LS4.8B: By the end of Grade 8, Students will using data to provide evidence that supports the concept that genetic information is passed on from both parents to offspring	Explain that characteristics of an organism result from inherited traits of one or more genes from the parents and others result from interactions with the environment.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS4.A: Evidence of Common Ancestry and Diversity	**The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.** MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.	History of the Earth	**ESS.2.8B:** By the end of Grade 8, students will use data about a rock's physical characteristics make and support an inference about the rock's history and connection to rock cycle.	Describe and model the processes of fossil formation. Describe how fossils provide important evidence of how life and environmental conditions have changed. Explain why more recently deposited rock layers are more likely to contain fossils resembling existing species than older rock layers. Explain how rocks and fossils are used to understand the age and geological history of the earth (timelines and relative dating, rock layers).

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS4.A: Evidence of Common Ancestry and Diversity	**Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent.** MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.	Evolution and Diversity	LS.1.8B: By the end of Grade 8, students will use a model, classification system, or dichotomous key to illustrate, compare, or interpret possible relationships among groups of organisms (e.g., internal and external structures, anatomical features).	Explain how species with similar evolutionary histories/characteristics are classified more closely together with some organisms than others (e.g., a fish and human have more common with each other than a fish and jelly fish).

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS4.A: Evidence of Common Ancestry and Diversity	**Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy.** MS-LS4-3 Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.	Heredity and Reproduction	LS.4.8A: By the end of Grade 8, students will compare and contrast sexual reproduction with asexual reproduction	Describe sexual reproduction as a process that combines genetic material of two parents to produce a new organism (e.g., sperm/egg, pollen/ova).
LS4.B: Natural Selection	**Natural selection leads to the predominance of certain traits in a population, and the suppression of others.** MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a	Evolution and Diversity	LS.5.8A: By the end of Grade 8, students will cite examples supporting the concept that certain traits of organisms may provide a survival advantage in a specific environment and therefore, an increased likelihood to produce offspring	Explain how natural selection leads to evolution (e.g., survival of the fittest).

	specific environment.			
NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS4.B: Natural Selection	In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.			

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
LS4.C: Adaptation	**Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.** MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	Evolution and Diversity	LS.5.8A: By the end of Grade 8, students will cite examples supporting the concept that certain traits of organisms may provide a survival advantage in a specific environment and therefore, an increased likelihood to produce offspring	Explain how a population's or species' traits affect their ability to survive over time. Describe possible causes for the extinction of an animal or plant. Cite evidence that demonstrates evolutionary relationships among organisms (e.g., similarities in body structure, early development, traits). Explain how natural selection leads to evolution (e.g., survival of the fittest).

Earth Science

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS1.A: The Universe and Its Stars	**Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.** MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	The Universe	ESS.1.8A By the end of Grade 8, students will describe the universe as containing many billions of galaxies, and each galaxy contains many billions of stars. ESS.1.8 B: By the end of Grade 8, students will relate the motions of the Earth-sun-moon system to eclipses and the seasons ESS.1.8 D: By the end of Grade 8, students will compare and contrast planets based on data provided about size, composition, location, orbital movement, atmosphere, or surface features (includes moons).	Describe how different stars can be seen at different times of the year and planets change their positions against the background of stars over time Explain the alignment of the earth, moon, and sun during solar and lunar eclipses. Observe that different stars can be seen at different times of the year and planets change their positions against the background of stars over time.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS1.A: The Universe and Its Stars	Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.	The Universe	ESS.1.8A By the end of Grade 8, students will describe the universe as containing many billions of galaxies, and each galaxy contains many billions of stars. ESS.1.8 D: By the end of Grade 8, students will compare and contrast planets based on data provided about size, composition, location, orbital movement, atmosphere, or surface features (includes moons).	Explain that the Sun is a star located within a galaxy of many other stars, "The Milky Way." Describe the position of the solar system in the Milky Way galaxy and the universe. Explain that billions of galaxies form most of the visible mass in the universe. Explain that nine planets of varied size, composition, and surface features move around the sun in elliptical orbits. Compare and contrast the planets in terms of size relative to the earth's surface and atmospheric features, relative distance from the sun, and ability to support life

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS1.B: Earth and the Solar System	**The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.** **The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.** MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. MS- ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.	Solar System	**ESS.1.8A** By the end of Grade 8, students will describe the universe as containing many billions of galaxies, and each galaxy contains many billions of stars. **ESS.1.8 D: By the end of Grade 8,** students will compare and contrast planets based on data provided about size, composition, location, orbital movement, atmosphere, or surface features (includes moons).	Investigate and describe the basic components of our solar system (e.g., planets, moons, asteroids, comets, and the sun). Give evidence for objects that orbit within the Solar System that impact Earth (e.g. asteroids, comets). Explain that the Earth is one of several planets that orbit the sun, and the moon orbits around the Earth.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS1.B: Earth and the Solar System	This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	Solar System	ESS.1.8 B: By the end of Grade 8, students will relate the motions of the Earth-sun-moon system to eclipses and the seasons	Use a model to demonstrate and explain that because the Earth is tilted relative to the plane of the Earth's yearly orbit around the sun, sunlight falls more intensely on different parts of the Earth during the year. Explain that the difference in heating of the Earth's surface produces the planet's seasons and weather patterns. Relate the tilt of the earth to the distribution of sunlight throughout the year and its effect on climate.
		Energy in Earth Systems	ESS.5. 8A: By the end of Grade 8, students will explain the water cycle in terms of its reservoirs, the movement between reservoirs, and the energy to move water	Use collected data to compare patterns relating to seasonal daylight changes. Use a drawing and/or model to explain that changes in the angle at which light from the sun strikes Earth, and the length of daylight, determine seasonal differences in the amount of energy received. Compare the hours of daylight and illustrate the angle that the sun's rays strikes the surface of Earth during summer, fall, winter, and spring in the Northern Hemisphere. Use a model to explain why the seasons are reversed in the Northern and Southern Hemispheres.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
		Solar System	ESS.1.8A By the end of Grade 8, students will describe the universe as containing many billions of galaxies, and each galaxy contains many billions of stars.	~~Provide an example of how technology has helped scientists investigate the universe~~ ~~Investigate and report how science has changed the accepted ideas regarding the nature of the universe throughout history.~~

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS1.C: The History of Planet Earth	**The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.** MS-ESS1- 4 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.	History of the Earth	**ESS.2.8A:** By the end of Grade 8, students will explain how earth events (abruptly and over time) can bring about changes in Earth's surface: landforms, ocean floor, rock features, or climate.	Describe how the history of the Earth is influenced by occasional natural occurrences, such as the impact of an asteroid or comet Plot location of volcanoes and earthquakes and explain the relationship between the location of these phenomena and faults.
ESS1.C: The History of Planet Earth	Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE) (secondary to MS-ESS2-3)	**Tectonics**	**ESS.4.8A:** By the end of Grade 8, students will use geological evidence to support the idea that the Earth's crust/lithosphere is composed of plates that move	Describe Earth's layers as a lithosphere (crust and upper mantle), convecting mantle, and dense metallic core. Describe, on the basis of relative position, density, and composition., Earth's layers as a lithosphere (crust and upper mantle), convecting mantle, and dense metallic core. Identify the energy sources that cause material to move within Earth. Model the movement of materials within Earth.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS2.A: Earth's Materials and Systems	**All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.** MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.	History of the Earth	**ESS.2.8A:** By the end of Grade 8, students will explain how earth events (abruptly and over time) can bring about changes in Earth's surface: landforms, ocean floor, rock features, or climate.	Describe how energy from the Earth's interior causes changes to Earth's surface (i.e., earthquakes, volcanoes). Describe how earthquakes and volcanoes transfer energy from Earth's interior to the surface (e.g., seismic waves transfer mechanical energy, flowing magma transfers heat and mechanical energy).
ESS2.A: Earth's Materials and Systems	**The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.** MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales	History of the Earth	**ESS.2.8A:** By the end of Grade 8, students will explain how earth events (abruptly and over time) can bring about changes in Earth's surface: landforms, ocean floor, rock features, or climate.	Describe events and the effect they may have on climate (e.g. El Nino, deforestation, glacial melting, and an increase in greenhouse gases). Evaluate slow processes (e.g. weathering, erosion, mountain building, sea floor spreading) to determine how the earth has changed and will continue to change over time. Evaluate fast processes (e.g. erosion, volcanoes and earthquakes) to determine how the earth has changed and will continue to change over time.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS2.B: Plate Tectonics and Large-Scale System Interactions	**Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.** MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.	Tectonics	ESS.4.8B: By the end of Grade 8, students will describe how the magnetic field of Earth and a magnet are similar.	Define and describe the location of the major plates and plate boundaries. Describe the three types of plate boundaries (convergent, divergent, transform) and geographic features associated with them (continental rifts and mid-ocean ridges, volcanic and island arcs, deep sea trenches). Explain how the theory of plate tectonics accounts for the motion of the lithospheric plates, the geologic activities at the plate boundaries, and the changes in landform areas over geologic time. Relate plate boundary movements to their resulting landforms, including: Mountains, faults, rift valleys, trenches and volcanoes.. Explain how scientists use seismic waves — primary, secondary, and surface waves to determine the internal structure of Earth.

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ESS2.B: Plate Tectonics and Large-Scale System Interactions	**Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.** MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.	History of the Earth	**ESS.2.8A:** By the end of Grade 8, students will explain how earth events (abruptly and over time) can bring about changes in Earth's surface: landforms, ocean floor, rock features, or climate.	Illustrate the geologic landforms of the ocean floor (including the continental shelf and slope, the mid-ocean ridge, rift zone, trench, and the ocean basin. Compare continental and oceanic landforms. Explain how natural processes (including weathering, erosion, deposition, landslides, volcanic eruptions, earthquakes, and floods) affect Earth's oceans and land in constructive and destructive ways. Explain how waves, currents, tides, and storms affect the geologic features of the ocean shore zone (including beaches, barrier islands, estuaries, and inlets). Illustrate the creation and changing of landforms that have occurred through geologic processes (including volcanic eruptions and mountain-building forces).

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS2.C: The Roles of Water in Earth's Surface Processes	**Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.** MS-ESS2-4 Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity	Energy in Earth Systems	ESS.5. 8A: By the end of Grade 8, students will explain the water cycle in terms of its reservoirs, the movement between reservoirs, and the energy to move water.	Identify the reservoirs of Earth's water cycle (e.g., ocean, ice caps/glaciers, atmosphere, lakes, rivers, biosphere, groundwater) locally and globally Illustrate the movement of water on Earth and describe how the processes that move water (e.g., evaporation of water, melting of ice/snow, ocean currents, movement of water vapor by wind) use energy from the sun. Describe the processes of evaporation, condensation, and precipitation as they relate to the water cycle. Construct a model or diagram to show how water continuously moves through the water cycle over time Describe the sun as the major source of energy for phenomena on Earth's surface, powering winds, ocean currents, the water cycle, and providing energy essential for life functions. Explain that photosynthetic cells convert solar energy into chemical energy that is used to carry on life functions or is transferred to consumers and used to carry on their life functions.
		Tectonics	PS.4.8C: By the end of Grade 8, students will describe electromagnetic energy from the Sun (solar radiation) as the major source of energy on Earth	

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS2.C: The Roles of Water in Earth's Surface Processes	**The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.** MS- ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.	Properties of Earth's Materials Biogeochemical Cycles	ESS.3.8C: By the end of Grade 8, students will describe how matter in the atmosphere cycles through other Earth systems. ESS.7.8C: By the end of Grade 8, students will explain the water cycle and identify the factors that affect the rate of evaporation, condensation, and cloud formation.	Summarize the relationship of the movement of air masses, high and low pressure systems, and frontal boundaries to storms (including thunderstorms, hurricanes, and tornadoes) and other weather conditions. Explain and trace the possible paths of water through the hydrosphere, geosphere, and atmosphere (i.e., the water cycle: evaporation, condensation, precipitation, surface run-off/ groundwater flow). Relate the different forms water can take (i.e., snow, rain, sleet, fog, clouds, dew, humidity) as it moves through the water cycle to atmospheric conditions (i.e., temperature, pressure, wind direction and speed, humidity) at a given geographic location.
ESS2.C: The Roles of Water in Earth's Surface Processes	**Global movements of water and its changes in form are propelled by sunlight and gravity.** MS-ESS2-4 Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity	Biogeochemical Cycles	ESS.7.8C: By the end of Grade 8, students will explain the water cycle and identify the factors that affect the rate of evaporation, condensation, and cloud formation.	Describe the processes of the hydrologic cycle, including evaporation, condensation, precipitation, surface runoff and groundwater percolation, infiltration, and transpiration. Explain how thermal energy is transferred throughout the water cycle by the processes of convection, conduction, and radiation.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS2.C: The Roles of Water in Earth's Surface Processes	**Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.** MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates	Climate and Weather	ESS.6.8A: By the end of Grade 8, students will explain the role of differential heating or convection in ocean currents, winds, weather and weather patterns, atmosphere, or climate	Explain how differential heating and convection affect Earth's weather patterns. Describe how differential heating of the oceans affects ocean currents that in turn influence weather and climate. Explain the relationship between differential heating/convection and the production of winds. Analyze global patterns of atmospheric movements to explain effects on weather
ESS2.C: The Roles of Water in Earth's Surface Processes	**Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.** MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales	History of the Earth	ESS.2.8A: By the end of Grade 8, students will explain how earth events (abruptly and over time) can bring about changes in Earth's surface: landforms, ocean floor, rock features, or climate.	Investigate the effect of flowing water on landforms (e.g. stream table, local environment).

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS2.D: Weather and Climate	**Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.** MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates	Climate and Weather	ESS.6.8A: By the end of Grade 8, students will explain the role of differential heating or convection in ocean currents, winds, weather and weather patterns, atmosphere, or climate	Explain how solar energy affects Earth's atmosphere and surface (land and water). Explain how convection affects weather patterns and climate. Explain the influence of global winds and the jet stream on weather and climatic conditions
ESS2.D: Weather and Climate	**Because these patterns are so complex, weather can only be predicted probabilistically.** MS- ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.	Climate and Weather	ESS.6.8A: By the end of Grade 8, students will explain the role of differential heating or convection in ocean currents, winds, weather and weather patterns, atmosphere, or climate	Predict weather conditions and patterns based on weather data collected from direct observations and measurements, weather maps, satellites, and radar

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS2.D: Weather and Climate	**The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents** MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates	Climate and Weather Properties of Earth's Materials	ESS.6.8A: By the end of Grade 8, students will explain the role of differential heating or convection in ocean currents, winds, weather and weather patterns, atmosphere, or climate ESS.3.8C: By the end of Grade 8, students will describe how matter in the atmosphere cycles through other Earth systems.	Explain how differential heating and convection affect Earth's weather patterns. Describe how differential heating of the oceans affects ocean currents that in turn influence weather and climate. Explain the relationship between differential heating/convection and the production of winds. Analyze global patterns of atmospheric movements to explain effects on weather Explain the interrelationship among the dynamic processes of the water cycle (including precipitation, evaporation, transpiration, condensation, surface-water flow, and groundwater flow).

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS3.A: Natural Resources	**Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.** MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.	Biogeochemical Cycles	ESS.7.8A: By the end of Grade 8, students will explain the importance of Earth's resources and identify ways in which various resources can be recycled and reused	Identify the properties of water that make it an essential component of the Earth system (e.g., its ability to act as a solvent, its ability to remain as a liquid at most Earth temperatures). Recognize, describe, and compare renewable energy resources (e.g., solar, wind, water, biomass) and nonrenewable energy resources (e.g., fossil fuels, nuclear energy). Describe the benefits of Earth's resources, air, soil, and trees. Describe the role atmosphere (e.g., clouds, ozone) plays in precipitation, reflecting and filtering light from the Sun, and trapping heat energy emitted from the Earth's surface
ESS3.B: Natural Hazards	**Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events.** MS-ESS3-2 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.			

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS3.C: Human Impacts on Earth Systems	**Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.** **Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.** MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	Biogeochemical Cycles	ESS.7.8A: By the end of Grade 8, students will explain the importance of Earth's resources and identify ways in which various resources can be recycled and reused	Describe how human needs and activities (e.g., irrigation, damming of rivers, waste treatment, sources of drinking water) have affected the quantity and quality of major bodies of fresh water. Describe the effects on the environment and on the carbon cycle of using both renewable and nonrenewable sources of energy Identify the ways humans affect the erosion and deposition of Earth's materials (e.g., clearing of land, planting vegetation, paving land, construction of new buildings). Identify ways that humans affect the atmosphere and the oceans and their limited capacity to absorb wastes and recycle materials naturally.

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ESS3.D: Global Climate Change	**Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.** MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	Biogeochemical Cycles	**By the end of Grade 8,** students will identify ways in which the atmosphere has been altered by living systems and has itself strongly affected living systems over the course of Earth's history	Define ozone and compare its effects in the lower and upper atmosphere. Describe the role of living organisms in producing the ozone layer and how the ozone layer affected the development of life on Earth. Compare the rate at which CO_2 is put into the atmosphere to the rate at which it is removed through the carbon cycle. Analyze data relating to the concentration of atmospheric CO_2 over the past 100 years, and describe international efforts to protect the atmosphere.

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ESS3.D: Global Climate Change	**Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.** MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	Properties of Earth's Materials	ESS.3.8C: By the end of Grade 8, students will describe how matter in the atmosphere cycles through other Earth systems.	Describe movement of a carbon atom from the atmosphere through a plant, animal, and decomposer, and back into the atmosphere Diagram the nitrogen cycle and provide examples of human actions that affect this cycle (e.g., fertilizers, crop rotation, fossil fuel combustion). Trace ways in which the atmosphere has been altered by living systems and has itself strongly affected living systems over the course of Earth's history Describe ways the biosphere, hydrosphere, and lithosphere interact with the atmosphere (e.g., volcanic eruptions putting ash and gases into the atmosphere, hurricanes, changes in vegetation).

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
ETS1.A: Defining and Delimiting Engineering Problems	The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. MS-ETS1-1			
ETS1.B: Developing Possible Solutions	A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. MS-ETS1-4 There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. MS-ETS1-2, MS-ETS1-3 Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. MS-ETS1-3 Models of all kinds are important for testing solutions. MS-ETS1-4			
NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators

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 those characteristics may be incorporated into the new design. MS-ETS1-3 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. MS- ETS1-4			

Science and Engineering Practices (STEM)

From publication: A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (NRC 2011)

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
1. Asking questions (science) and defining problems (engineering)	**Asking questions and defining problems in grades 6–8 builds from grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.** Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles. (MS-PS2-3) Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5) Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS- ETS1-1)			

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
2. Developing and using models	**Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more** abstract phenomena and design systems. Develop a model to predict and/or describe phenomena. (MS-PS1-1), (MS-PS1-4) Develop a model to describe unobservable mechanisms. (MS-PS1-5) (MS-PS3-2) (MS-LS1-7) . (MS-ESS2-4) Develop and use a model to describe phenomena. (MS-PS4-2). (MS-LS1-2). (MS-LS2-3) (MS-LS3-1),(MS-LS3-2) (MS-ESS1-1),(MS-ESS1-2) (MS- ESS2-1), (MS-ESS2-6) Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)			

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
3. Planning and carrying out investigations	**Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.** Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS2-2) Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation. (MS-PS2-5) (MS-LS1-1) Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS3-4 Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.			

	(MS-ESS2-5)			
NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
4. Analyzing and interpreting data	**Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.** Analyze and interpret data to determine similarities and differences in findings. (MS-PS1-2) Construct and interpret graphical displays of data to identify linear and nonlinear relationships. (MS-PS3-1) Analyze and interpret data to provide evidence for phenomena. (MS-LS2-1) (MS-ESS2-3) Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3) Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1) Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3) (MS-ESS3-2) . (MS-ETS1-3)			

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
5. Using mathematics and computational thinking	Mathematical and computational thinking at the 6–8 level builds on K–5 and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments. Use mathematical representations to describe and/or support scientific conclusions and design solutions. (MS-PS4-1) Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6)			

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
6. Constructing explanations (science) and designing solutions(engineering)	Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories. Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS- PS1-6) Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1) Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system. (MS-PS3-3) Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-5),(MS-LS1-6) Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2)			

	Apply scientific ideas to construct an explanation for real- world phenomena, examples, or events. (MS-LS4-2)Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4) Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-ESS1- 4) (MS-ESS2-2) (MS-ESS3-1) Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)			

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
7. Engaging in argument from evidence	**Engaging in argument from evidence in 6–8 builds from K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.** Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-PS2-4) Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. (MS-PS3-5) Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3) Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS1-4) (MS-LS2-4) (MS-ESS3-4) Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2- 5) (MS-ETS1-2)			

NGSS	Progression 6 to 8	AERO	Benchmark 6 to 8	AERO Performance Indicators
8. Obtaining, evaluating, and communicating information	**Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods.** Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-PS1-3) Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings. (MS-PS4-3) Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS1-8) Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS4-5)			