Grade 7 Science: Year at a Glance

UNIT 1, STRUCTURE AND PROPERTIES OF MATTER	**Instructional days: 18**
Essential questions:	How do atomic and molecular interactions explain the properties of matter that we see and feel? How can particles combine to produce a substance with different properties? What happens when new materials are formed? What stays the same and what changes?

Unit abstract: Upon completion of this unit of study, students will be able to apply an understanding that pure substances have characteristic physical and chemical properties and are made from a single type of atom or molecule. They will be able to provide molecular-level accounts to explain that chemical reactions involve regrouping of atoms to form new substances, and that atoms rearrange during chemical reactions. Students are expected to demonstrate proficiency in developing and using models and analyzing and interpreting data. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas. The crosscutting concepts of scale, proportion, and quantity will support student understanding across the unit of study.

Performance Expectations **Disciplinary Core Ideas**		**Learning Goals** (Foundation Box)			**Connections to the CCSS – ELA**	**Connections to the CCSS – Mathematics**
		Disciplinary Core Ideas	**Science and Engineering Practices**	**Crosscutting Concepts**		
MS-PS1-1	Develop models to describe the atomic composition of simple molecules and extended structures.	PS1.A	Developing and Using Models	Scale, Proportion, and Quantity	RST.6-8.7	MP.2 MP.4 6.RP.A.3
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.	PS1.A PS1.B	Analyzing and Interpreting Data	Patterns	RST.6-8.1 RST.6-8.7	MP.2 6.RP.A.3 6.SP.B.4 6.SP.B.5

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UNIT 2, INTERACTIONS OF MATTER — Instructional days: 18

Essential questions:
How can particles combine to produce a substance with different properties?
How does thermal energy affect particles?
What happens when new materials are formed? What stays the same and what changes?
How do atomic and molecular interactions explain the properties of matter we see and feel?

Unit abstract: Upon the completion of this unit of study, students will be able to provide molecular-level accounts of states of matter and changes between states, of how chemical reactions involve regrouping of atoms to form new substances, and of how atoms rearrange during chemical reactions. Students are also able to apply an understanding of optimization design and process in engineering to chemical reaction systems. Students are expected to demonstrate proficiency in obtaining, evaluating, and communicating information and developing and using models. The crosscutting concepts of structure and function; cause and effect; interdependence of science, engineering, and technology; and influence of science, engineering, and technology on society and on the natural world are organizing concepts for these disciplinary core ideas.

Performance Expectations / Disciplinary Core Ideas		Learning Goals (Foundation Box): Disciplinary Core Ideas	Learning Goals (Foundation Box): Science and Engineering Practices	Learning Goals (Foundation Box): Crosscutting Concepts	Connections to the CCSS – ELA	Connections to the CCSS – Mathematics
MS – PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	PS1.A PS1.B	Obtaining, Evaluating, and Communicating Information	Structure and Function	RST.6-8.1 WHST.6-8.8	
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.	PS1.A PS3.A	Developing and Using Models	Cause and Effect	RST.6-8.7	6.NS.C.5

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UNIT 3, CHEMICAL REACTIONS	**Instructional days: 24**
Essential questions:	How do atomic and molecular interactions explain the properties of matter that we see and feel? How does thermal energy affect particles?

Unit abstract: Upon completion of this unit of study, students will be able to provide molecular-level accounts of states of matters and changes between states, of how chemical reactions involve regrouping of atoms to form new substances, and of how atoms rearrange during chemical reactions. Students will also be able to apply an understanding of optimization design and process in engineering to chemical reaction systems. The crosscutting concept of energy and matter is the organizing concept for these disciplinary core ideas. Students are expected to demonstrate proficiency in developing and using models; analyzing and interpreting data; designing solutions; and obtaining, evaluating, and communicating information. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.
In this unit students will define problems more precisely in order to conduct a more thorough process of choosing the best solution and to optimize the final design. The focus is on a two-stage process of evaluating proposed ideas, using a systematic method to determine which proposed solutions are most promising, testing different solutions, and then combining the best ideas into a new solution that may be better than any of the preliminary ideas. Improving designs involves an iterative process in which students test the best design, analyze the results, modify the design accordingly, and then retest and modify the design again. Students may go through this cycle two, three, or more times in order to reach the optimal (best possible) result.

Performance Expectations Disciplinary Core Ideas		**Learning Goals** (Foundation Box)			**Connections to the CCSS – ELA**	**Connections to the CCSS – Mathematics**
		Disciplinary Core Ideas	**Science and Engineering Practices**	**Crosscutting Concepts**		
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.	PS1.B	Developing And Using Models	Energy and Matter	RST.6-8.7	MP.2 MP.4 6.RP.A.3
MS-PS1-6*	. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*	PS1.B ETS1.B ETS1.C	Constructing Explanations and Designing Solutions	Energy and Matter	RST.6-8.3 WHST.6-8.7	
MS-ETS1.2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	ETS1.B	Engaging in Argument from Evidence		RST.6-8.1 RST.6-8.9 WHST.6-8.7 WHST.6-8.9	MP.2 7.EE.3
MS-ETS1.3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	ETS1.B ETS1.C	Analyzing and Interpreting Data		RST.6-8.1 RST.6-8.7 RST.6-8.9	MP.2 7.EE.3
MS-ETS1.4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	ETS1.B ETS1.C	Developing and Using Models		SL.8.5	MP.2 7.SP

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UNIT 4, STRUCTURE AND FUNCTION	**Instructional days: 15**
Essential questions:	How do the structures of organisms contribute to life's functions? How can one explain the ways in which cells contribute to the function of living organisms?

Unit abstract: Students will plan and carry out investigations to develop evidence that living organisms are made of cells. Students will gather information to support explanations of the relationship between structure and function in cells. They will be able to communicate an understanding of cell theory and understand that all organisms are made of cells. Students will understand that special structures are responsible for particular functions in organisms. They will then be able to use their understanding of cell theory to develop and use physical and conceptual models of cells. The crosscutting concepts of scale, proportion, and quantity and structure and function are the organizing concepts for these core ideas about processes of living organisms.

Performance Expectations **Disciplinary Core Ideas**		**Learning Goals** (Foundation Box)			**Connections to the CCSS – ELA**	**Connections to the CCSS – Mathematics**
		Disciplinary Core Ideas	**Science and Engineering Practices**	**Crosscutting Concepts**		
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.	LS1.A	Planning and Carrying Out Investigations	Scale, Proportion, and Quantity	WHST.6-8.7	6.EE.C.9
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.	LS1.A	Developing and Using Models	Structure and Function	SL.8.5	6.EE.C.9

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UNIT 5, BODY SYSTEMS	**Instructional days: 15**
Essential questions:	How can one explain the ways in which cells contribute to the function of living organisms? How do the structures of organisms contribute to life's functions?

Unit abstract: Upon the completion of this unit, students will have a basic understanding of the role of cells in body systems and how those systems work to support the life functions of the organism. Students will construct explanations for the interactions of systems in cells and organisms. Students will understand that special structures are responsible for particular functions in organisms, and that for many organisms, the body is a system of multiple-interaction subsystems that form a hierarchy, from cells to the body. Students will also be able to construct explanations for the interactions of systems in cells and organisms and for how organisms gather and use information from the environment. Students are expected to demonstrate proficiency while engaging in argument from evidence and obtaining, evaluating, and communicating information. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas. The crosscutting concepts of systems and system models and cause and effect will support student understanding across the unit of study.

Performance Expectations **Disciplinary Core Ideas**		**Learning Goals** (Foundation Box)			**Connections to the CCSS – ELA**	**Connections to the CCSS – Mathematics**
		Disciplinary Core Ideas	**Science and Engineering Practices**	**Crosscutting Concepts**		
MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.	LS1.A	Engaging In Argument From Evidence	Systems and System Models	RST.6-8.1 RI.6.8 WHST.6-8.	6.EE.C.9
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.	LS1.D	Obtaining, Evaluating, and Communicating Information	Cause and Effect	WHST.6-8.8	

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UNIT 6, INHERITANCE AND VARIATIONS OF TRAITS — Instructional days: 15

Essential question: How do living organisms pass traits from one generation to the next?

Unit abstract: In this unit of study, students will use models to describe how gene mutations and sexual reproduction contribute to genetic variation. Students will understand how genetic factors determine the growth of an individual organism. They will also demonstrate understanding of the genetic implications of sexual and asexual reproduction. The crosscutting concepts of cause and effect and structure and function provide students with a deeper understanding of how gene structure determines differences in the functioning of organisms. Students will develop and use models to determine phenomena to demonstrate understanding of the disciplinary core ideas.

Performance Expectations / Disciplinary Core Ideas		Learning Goals (Foundation Box): Disciplinary Core Ideas	Learning Goals (Foundation Box): Science and Engineering Practices	Learning Goals (Foundation Box): Crosscutting Concepts	Connections to the CCSS – ELA	Connections to the CCSS – Mathematics
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.	LS3.A LS3.B	Developing and Using Models	Structure and Function	RST.6-8.1 RST.6-8.4 RST.6-8.7 SL.7.5	
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.	LS3.A LS3.B LS1.B	Developing and Using Models	Cause and Effect	RST.6-8.1 RST.6-8.4 RST.6-8.7 SL.7.5	MP.4 6.SP.B.5

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UNIT 7, ORGANIZATION FOR MATTER AND ENERGY FLOW IN ORGANISMS	Instructional days: 15
Essential questions:	How do organisms obtain and use matter and energy? How do matter and energy move through an ecosystem?

Unit abstract: Upon completion of this unit of study, students will have a basic understanding that cells provide a context for the plant process of photosynthesis in the movement of matter and energy needed for the cell. Students can use conceptual and physical models to explain the transfer of energy and cycling of matter as they construct explanations for the role of photosynthesis in cycling matter in ecosystems. They can construct scientific explanations for the cycling of matter in organisms and the interactions of organisms to obtain matter and energy from an ecosystem to survive and grow. They understand that sustaining life requires substantial energy and matter inputs, and that the structure and functions of organisms contribute to the capture, transformation, transport, release, and elimination of matter and energy. The crosscutting concept of energy and matter supports an understanding of the cycling of matter and energy flow into and out of organisms.

Performance Expectations Disciplinary Core Ideas		Learning Goals (Foundation Box) Disciplinary Core Ideas	Learning Goals (Foundation Box) Science and Engineering Practices	Learning Goals (Foundation Box) Crosscutting Concepts	Connections to the CCSS – ELA	Connections to the CCSS – Mathematics
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.	LS1.C PS3.D	Constructing Explanations and Designing Solutions	Energy and Matter	RST.6-8.1 RST.6-8.2 WHST.6-8.2 WHST.6-8.9	6.EE.C.9
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.	LS1.C PS3.D	Developing and Using Models	Energy and Matter	SL.8.5	

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UNIT 8, EARTH SYSTEMS	**Instructional days: 30**
Essential questions:	How do people figure out that the Earth and life on Earth have changed over time? How does the movement of tectonic plates affect the surface of Earth? How do the materials in and on Earth's crust change over time?

Unit abstract: Students examine geoscience data in order to understand processes and events in Earth's history. Important concepts in this topic are "Scale, Proportion, and Quantity," "Stability and Change," and "Patterns," in relation to the different ways geologic processes operate over the long expanse of geologic time. An important aspect of the history of Earth is that geologic events and conditions have affected the evolution of life, but different life forms have also played important roles in altering Earth's systems. Students understand how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. Students can investigate the controlling properties of important materials and construct explanations based on the analysis of real geoscience data. Students are expected to demonstrate proficiency in analyzing and interpreting data and constructing explanations, and they are expected to use these practices to demonstrate understanding of the core ideas.

Performance Expectations **Disciplinary Core Ideas**		**Learning Goals** (Foundation Box)			**Connections to the CCSS – ELA**	**Connections to the CCSS – Mathematics**
		Disciplinary Core Ideas	**Science and Engineering Practices**	**Crosscutting Concepts**		
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.	ESS1.C	Constructing Explanations and Designing Solutions	Scale, Proportion, and Quantity	RST.6-8.1 WHST.6-8.2	6.EE.B.6 7.EE.B.4
MS-ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.	ESS2.A	Developing and Using Models	Stability and Change	SL.8.5	
MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.	ESS2.A ESS2.C	Constructing Explanations and Designing Solutions	Scale, Proportion, and Quantity	RST.6-8.1 WHST.6-8.2 SL.8.5	MP.2 6.EE.B.6 7.EE.B.4
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.	ESS1.C ESS2.B	Analyzing and Interpreting Data	Patterns	RST.6-8.1 RST.6-8.7 RST.6-8.9	MP.2 6.EE.B.6 7.EE.B.4

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