Grade 6: Matter and Its Interactions

Stage 1 Desired Results

ESTABLISHED GOALS:

Competencies:

- **Nature of Science-** Students will work collaboratively and individually to generate testable questions or define problems in terms of given constraints and criteria; plan and conduct investigations or apply engineering design practices to analyze and interpret data, and construct and communicate evidence-based explanations or possible optimal solutions.
- **Patterns-** Students will observe, predict, and analyze patterns in order to support evidence-based claims about relationships (e.g., cause and effect, structure and function, macroscopic and microscopic).
- **Cause and Effect-** Students will investigate, explain, and evaluate potential causal relationships, using evidence to support claims and predictions about the mechanisms that drive those relationships.
- **Structure and Function-** Students will analyze the relationship among structure and function of natural or human designed objects, using evidence to redesign or support claims about survival and/or improved performance
- Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials.
- Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences.
- Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style.

Content Standards:

- MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.
- MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact

Transfer

*Students will be able to independently use their learning to **investigate causal relationships in order to explain change.***

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- cause and effect relationships may be used to predict phenomena in natural or designed systems.
- time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
- structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.
- engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.
- macroscopic patterns are related to the nature of microscopic and atomic-level structure.
- matter is conserved because atoms are conserved in physical and chemical processes.
- that the transfer of energy can be tracked as energy flows through a designed or natural system.

ESSENTIAL QUESTIONS

- Which state of matter is more important for survival?
- Which reactions are the most important in everyday life?

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-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. - MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. - MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.	***Acquisition***	
	Students will know… - that substances are made from different types of atoms, which combine with one another in various ways. - that atoms form molecules that range in size from two to thousands of atoms. - that each pure substance has characteristic physical and chemical properties that can be used to identify it. - that gases and liquids are made of molecules or inert atoms that are moving about relative to each other. - that in a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide; that in a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. - that solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). - that the changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. - that substances react chemically in characteristic ways. - that 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. - that the term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal	*Students will be skilled at…* - analyzing and interpreting data. - gathering and making sense of information. - developing and using models. - designing a project to construct, test, and modify a device.

	energy from one object to another. - that in science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. - that the temperature of a system is proportional to the average internal kinetic energy and potential energy. - that temperature is not a direct measure of a system's total thermal energy. - that each pure substance has characteristic physical and chemical properties that can be used to identify it. - that substances react chemically in characteristic ways. - that 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. - that the total number of each type of atom is conserved, and thus the mass does not change. - that some chemical reactions release energy, others store energy. *vocabulary:* atoms, compound, element, molecule, state of matter. phase change, solid, liquid, gas, thermal energy, temperature, heat, potential energy, kinetic energy, exothermic, endothermic, products, reactants, chemical change, physical change, physical property, chemical property, electron, proton, neutron, nucleus	

Content Area Literacy Standards	***21st Century Skills***
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*. RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually. RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. WHST.6-8.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research.	• *use systems thinking* • *think creatively* • *work creative with others* • *implement innovations* • *be self-directed learners*

Stage 2 - Evidence

Evaluative Criteria	***Assessment Evidence***
	PERFORMANCE TASK(S):
	OTHER EVIDENCE:

Stage 3 – Learning Plan

Summary of Key Learning Events and Instruction

Science and Engineering Practices	***Mathematics Integration***
S&EP 2. Developing and using models S&EP 3 Planing and carrying out investigations S&EP 7 Engaging in argument from evidence	• MP.2 Reason abstractly and quantitatively. • MP.4 Model with mathematics. • 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. • 6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. • 8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.
Technology Integration	***District Materials***