NGSS CORRELATIONS

CHEMISTRY OF MATERIALS

Crosscutting Concepts		Activity number
Cause and Effect	Cause and effect relationships may be used to predict phenomena in natural or designed systems.	8, 9, 10
Structure and Function	Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.	7
	Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.	1, 2, 3, 4, 5, 11, 12, 13
Scale, Proportion, and Quantity	Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.	6, 7, 12
	Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.	4
	Scientific relationships can be represented through the use of algebraic expressions and equations.	4
Connections to Engineering, Technology, and Applications of Science	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	1, 2, 3, 5, 11, 13
	The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time.	
Science and Engineering Practices		**Activity number**
Analyzing and Interpreting Data	Analyze and interpret data to determine similarities and differences in findings.	1, 2, 3, 4, 11
	Analyze and interpret data to provide evidence for phenomena.	10
Asking Questions and Defining Problems	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.	1
	Ask questions to identify and clarify evidence of an argument.	
	Ask questions that challenge the premise(s) of an argument or the interpretation of a data set.	5

Science and Engineering Practices		Activity number
Constructing Explanations and Designing Solutions	Construct an explanation that includes qualitative or quantitative relationships between variables that predict or describe phenomena.	8, 10
	Apply scientific ideas to construct an explanation for real world phenomena, examples, or events.	13
Developing and Using Models	Develop a model to predict and/or describe phenomena.	6, 7, 8, 9, 10, 12
	Develop a model to describe unobservable mechanisms.	6, 8, 9, 10, 12
	Evaluate limitations of a model for a proposed object or tool.	12
Engaging in Argument from Evidence	Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon.	9
Obtaining, Evaluating, and Communicating Information	Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings.	5, 7
	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.	1, 2, 5, 11, 13
Planning and Carrying Out Investigations	Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.	2, 3, 4, 9, 10, 11
Using Mathematics and Computational Thinking	Apply mathematical concepts and/or processes (e.g., ratio, rate, percent, basic operations, simple algebra) to scientific and engineering questions and problems.	4
Disciplinary Core Ideas		**Activity number**
Structure and Properties of Matter (PS1.A)	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.	2, 6, 7, 11, 12
	Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.	1, 2, 3, 4, 5, 11, 12, 13
	Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.	8, 9, 10
	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.	8, 9, 10
	Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).	6, 7, 11, 12
	The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.	9, 10

Disciplinary Core Ideas		Activity number
Chemical Reactions (PS1.B)	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.	3, 11, 12
Definitions of Energy (PS3.A)	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 energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects.	9, 10
	The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material.	8, 9, 10
Performance Expectations		**Activity number**
Matter and Its Interactions (PS1)	Develop models to describe the atomic composition of simple molecules and extended structures. (MS-PS1-1)	12
	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. (MS-PS1-3)	13
	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-PS1-4)	10

COMMON CORE STATE STANDARDS CORRELATIONS

CHEMISTRY OF MATERIALS

Common Core State Standards – English Language Arts		Activity number
Reading in Science and Technical Subjects (RST)	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (RST.6-8.2)	7
	Follow precisely a multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks. (RST.6-8.3)	2, 3, 10, 11
	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (RST.6-8.7)	7, 13
Writing in History/ Social Studies, Science, and Technological Subjects (WHST)	Write arguments focused on discipline-specific content. (WHST.6-8.1)	1, 13
	Draw evidence from informational texts to support analysis, reflection, and research. (WHST.6-8.9)	13
Common Core State Standards – Mathematics		**Activity number**
Ratios and Proportional Reasoning (RP)	Recognize and represent proportional relationships between quantities. (7.RP.A.2)	4