Readorium Alignment to FOSS Kit: Chemical Interaction		
Readorium Books By Standard	**Magazine Articles (A) and Science Alive Videos (V) By Standard**	**Teacher Resource Center Classroom Strategy Lessons (CL) with Articles (A) by Standard**
NGSS: MS-PS1: Matter and its interactions How can one explain the structure, properties, and interactions of matter?		
NGSS: MS-PS1.A: Structure and Properties of matter How do particles combine to form the variety of matter one observes? [All substances are made from some 100 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. Pure substances are made from a single type of atom or molecule; each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. 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 each other; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and vibrate in position but do not change relative locations. Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g. crystals). The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (Boundary: Predictions here are qualitative, not quantitative.)]		
• Chemical and Physical Properties of Matter 1 • Chemical and Physical properties of Matter 2	• Crime Scene Science (A) • Matter Matters (A)	• Determining Importance (CL-3, A-2 Crystals)
NGSS: MS-PS1.B: Chemical reactions How do substances combine or change (react) to make new substances? How does one characterize and explain these reactions and make predictions about them? [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. The total number of each type of atom is conserved, and thus the mass does not change. Some chemical reactions release energy, others store energy.]		
• Chemical and Physical Properties of Matter 1 • Chemical and Physical properties of Matter 2	• Cafeteria Chemistry: Play with Your Food & Astound Friends (A) • Crystals (A) • Kitchen Chemistry (A) • The Cool World of Chemistry (A) • Excuse me, Burping is Natural (A)	• Creating Sensory Images (CL-1, A-2 Kitchen Chemistry) • Determining Importance (CL-3, A-2 Crystals)
NGSS: MS-PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.		
• Chemical and Physical Properties of Matter 1 • Chemical and Physical Properties of Matter 2	• Crime Scene Science(A) • Matter Matters(A)	• Determining Importance (CL-3, A-2 Crystals)
NGSS: 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.		
• Chemical and Physical Properties of Matter 1 • Chemical and Physical Properties of Matter 2	• Cafeteria Chemistry: Play with Your Food & Astound Friends (A) • Crystals (A) • Kitchen Chemistry (A) • The Cool World of Chemistry (A) • Excuse me, Burping is Natural (A)	• Creating Sensory Images (CL-1, A-2 Kitchen Chemistry) • Determining Importance (CL-3, A-2 Crystals)
NGSS: MS-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.		

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NGSS: MS-PS1-4: Develop model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.		
• Pollution	•	•
NGSS: 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.		
•	• Gold - The Magnificent Metal (A) • Crystals (A)	•
NGSS: MS-PS1-6 Undertake a design project to construct, test and modify a device that either releases or absorbs thermal energy by chemical processes.		
• The Formation of Volcanoes	• The Science of Movie Stunts(A)	•
NGSS: MS-PS3: Energy_How is energy transferred and conserved?		
NGSS: MS-PS3.A: Definitions of energy What is energy? [Motion energy is properly called kinetic energy; it is proportional to the mass of moving object and grows with the square of its speed. A system of objects may also contain stored (potential) energy, depending on their relative positions. Stored energy is decreased in some chemical reactions and increased in others. The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or moleculeswithin a substance) and energy transfers by convection, conduction, 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. Temperature is a measure of the average kintetic 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.]		
• Lights Sound Action • Sports Physics • Newton's Laws	•	•
NGSS: MS-PS3.B: Conservation of energy and energy transfer What is meant by conservation of energy? How is energy transferred between objects or systems? [When the motion energy of an object changes, there is inevitably some other change in energy at the same time. For example, the friction that causes a moving object to stop also results in an increase in the thermal energy in both surfaces; eventually heat energy is transferred to the surrounding environmental as the surfaces cool. 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. Energy is transferred out of hotter regions or objects and into colder ones by the processes of conduction, convection, and radiation.]		
• Sports Physics	• Weapons Older than Dirt: The History of Some of the World's Most Ancient Weapons (A) • Things That Go BOOM!: The History and Chemistry of Explosives (A)	•
NGSS: MS-PS3-3: Apply scientific principles to design, construct, and test a devie that either minimizes or maximizes thermal energy transfer.		
• Lights Sound Action	• Hot Stuff: Heat on the Move (A)	•
NGSS: MS-PS3-4: Plan an investigation to determine the relationships among the energy transferred, they type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.		
• Lights Sound Action	• Space Junk: Are We Trashing our Solar System? (A)	•

NGSS: 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.		
• Lights Sound Action • Sports Physics	• Weapons Older than Dirt: The History of Some of the World's Most Ancient Weapons (A) • Machines of Ancient War: The Physics and History of Siege Engines (A)	•
NGSS: MS-ETS1: Engineering design-how do engineers solve problems?		
NGSS: MS-ETS1.A: Defining and delimiting an engineering problem What is a design for? What are the criteria and constraints of a successful solution? [The more precisely and 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 (e.g., familiarity with the local climate may rule out certain plants for the school garden).]		
• Artificial Satellites • Character Traits of a Good Scientist • Learning from Natural Disasters • Pollution	• Inventor of the Toughest Stuff (A) • Antlers, Beaks, Geckos and Us (V) • Safe from Tsunamis (V) • An Amazing Teen Scientist (A)	• Context Clues (CL-3 A-1 Things That Go Boom!) • Determining Importance (CL-2, A-1. Dragonflies: Flying Aces)
NGSS: MS-ETS1.B: Developing possible solutions What is the process for developing potential design solutions? [A solution needs to be tested, and then modified on the basis of the rest results, in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.		
• Superstition or Science	• Computer's Best Friend(A) • Things That Go BOOM!: The History and Chemistry of Explosives(A) • Crazy Careers in Science(A)•Space psychologist(A) • From Waste to Energy: Bacteria Gives a Boost(V) • Hydrogen Power(V) • Wave of Future-Green Gasoline(V) • Pig Poop & Other Energy Sources(V) • Getting Ready for Earthquakes(V) • Chores Don't Have to be a Pain in the But...ler(V) • Musical Computer(V) • Robots of Your Dreams(V) • Robots with Whiskers(V) • Sensible Sensors(V) • Signing Made Simple(V)•Smart Cars!(V) • The Ins and Outs of the Brain(V) • Strong &Sensitive: Metal Foam(V) • Smart Helicopters(V) • X-Ray Vision: Beyond the Bones(V) • Picking Your Brain(V)•The Creative Brain(V) • The Good, Bad, and Baby(V) • What Makes Us Tick(V) • Locked-in Syndrome: (V)	• Context Clues (CL-3 A-1 Things That Go Boom!)

	• Nanoparticles: Tiny Glowing Cancer Killers(V) • Tongue Driven (V) • Vision for Blind People-Fact or Fiction(V) • Extreme Bacteria(V) • Lord of the Tree Rings(V) • Coral Corrosion(V) • Disappearing Frogs(V) • Earthworm Invasion(V) • ESP: A Lab in a Can(V) • Flowing Free(V) • Virtual Wildfires(V) • Women Powered Robots(V) • Wave of the Future: Clean Ocean Energy(V)	
NGSS: MS-ETS1.C: Optimizing the design solution How can the various proposed design solutions be compared and improved? [There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. Comparing different designs could involve running them through the same kinds of tests and systematically recording the results to determine which design performs best. 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 chraacteristics may be incorporated into the new design. This 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. Once such a suitable solution is determined, it is important to describe that solution, explain how it was developed, and describe the freature that make it successful.		
• Microscopes • Space Race • Superstition or Science	• Do Scientists Cheat? (A)	•
NGSS: MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.		
• Artificial Satellites • Character Traits of a Good Scientist • Learning from Natural Disasters • Pollution	• Inventor of the Toughest Stuff (A) • Antlers, Beaks, Geckos and Us (V) • Safe from Tsunamis (V) • An Amazing Teen Scientist (A)	• Context Clues (CL-3 A-1 Things That Go Boom!) • Determining Importance (CL-2, A-1. Dragonflies: Flying Aces)
NGSS: MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how ell they meet the criteria and constraints of the problem.		
• Superstition or Science	• Computer's Best Friend(A) • Things That Go BOOM!: The History and Chemistry of Explosives(A) • Crazy Careers in Science(A)•Space psychologist(A) • From Waste to Energy: Bacteria Gives a Boost(V) • Hydrogen Power(V) • Wave of Future-Green Gasoline(V)	• Context Clues (CL-3 A-1 Things That Go Boom!)

	• Pig Poop & Other Energy Sources(V) • Getting Ready for Earthquakes(V) • Chores Don't Have to be a Pain in the But...ler(V) • Musical Computer(V) • Robots of Your Dreams(V) • Robots with Whiskers(V) • Sensible Sensors(V) • Signing Made Simple(V)•Smart Cars!(V) • The Ins and Outs of the Brain(V) • Strong &Sensitive: Metal Foam(V) • Smart Helicopters(V) • X-Ray Vision: Beyond the Bones(V) • Picking Your Brain(V)•The Creative Brain(V) • The Good, Bad, and Baby(V) • What Makes Us Tick(V) • Locked-in Syndrome: (V) • Nanoparticles: Tiny Glowing Cancer Killers(V) • Tongue Driven (V) • Vision for Blind People-Fact or Fiction(V) • Extreme Bacteria(V) • Lord of the Tree Rings(V) • Coral Corrosion(V) • Disappearing Frogs(V) • Earthworm Invasion(V) • ESP: A Lab in a Can(V) • Flowing Free(V) • Virtual Wildfires(V) • Women Powered Robots(V) • Wave of the Future: Clean Ocean Energy(V)	
NGSS: MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the solution to better meet the criteria for success.		
• Microscopes • Space Race • Superstition or Science	• Do Scientists Cheat? (A)	•
NGSS: 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.		
• Microscopes • Space Race • Scientific Method	•	• Graphic Features (CL-2, A-1 High School Track)