Aligning with Next Generation Science Standards: For Educators, By Educators

Infinite Potential: Restructuring the Energy Portfolio

JASON Learning's energy curriculum is aligned to Next Generation Science Standards (NGSS), Common Core and individual state science standards. JASON's NGSS Task Force, based in Rhode Island and comprised of administrators and classroom teachers, created this table to describe the alignments to NGSS. Performance Expectations, Disciplinary Core Ideas, Crosscutting Concepts, and Science and Engineering Practices supported by the chapter readings, labs, and field assignments for each expedition are included here for grades 5-12. This table does not include alignments to elementary school levels though they may be present. Alignments to Common Core, and state and local standards are searchable from within the JASON Mission Center (JMC). The Digital Library in the JMC includes more detailed alignments of individual resources (articles, images, videos, labs, field assignments, and digital simulations) to these standards.

*** (Asterisk):** The lab activity or field assignment engages students in three-dimensional learning as presented in *A Framework for K-12 Science Education* (National Research Council, 2012), and prepares students to reach associated performance expectations by the end of the grade or grade bands. Readings deepen and support student understanding of core ideas, crosscutting concepts, and science and engineering practices.

E (Extension): The lab activity or field assignment provides the opportunity to prepare students to reach associated performance expectations and develop core ideas, cross-cutting concepts and science & engineering practices by extending the existing lesson as suggested in the teaching tips section (teacher's edition) or through simple modification.

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	Chapter Readings	**Lab 1** Energy Survey Lab	**Lab 2** Changes in Potential	**Lab 3** Exploring Visible Light	**Lab 4** Detecting Ultraviolet Radiation	**Field Assignment** Exploring Energy	Chapter Readings	**Lab 1** Energy Transfers & Transformations	**Lab 2** Wave Tank Tsunami	**Lab 3** Thermal Energy Survey Lab	**Lab 4** Electrochemical Cells	**Field Assignment** Exploring Transfers & Transformations	Chapter Readings	**Lab 1** Exploring Magnetism	**Lab 2** Series and Parallel Circuits	**Lab 3** Generating Electricity	**Lab 4** Water Wheel	**Field Assignment** Don't Leave Footprints	Chapter Readings	**Lab 1** Wind Power	**Lab 2** Generating Hydrogen Gas	**Lab 3** Biofuels: Into the Woods	**Lab 4** Biofuels: Into the Lab	**Field Assignment** Enzymes are Key	Chapter Readings	**Lab 1** Cooling Off	**Lab 2** Making Models	**Lab 3** Using the Sun's Power	**Lab 4** Communicating with Graphics	**Field Assignment** Commencing Countdown
Performance Expectations																														
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.																					*		E							
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.							*			E																			
MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.	*	*																												
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.	*		E				*					E																		
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.	*	E					*					*					E													

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MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.	*						*			*									*						*	*	E			
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.	*						*			*																				
MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.	*	E					*		E			*					*			E										
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.							*		*																					
MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	*			*	*		*		*																					
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.																			*					E	*					
MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.												*																		
MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.													*					E	*						*			*	*	*
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.													*					E	*		E			*	*				*	

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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.								*				*	*				E	E	*	*					*	E	*			*
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.								*				*				*	E		*	*					*	E	*			*
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.								*				E					E			*						E	E			E
MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that optimal design can be achieved.								*					*			*	*									E				E
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.																							*							
HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.													*	E		*														
HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.							*					*																		

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HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (2nd Law of Thermodynamics).							*	*			E	E	*	E	E	*	*													
HS-PS3-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.							*			*															*	*				
HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost benefit ratios.													*	E	E	*														
HS-ESS3-4. Evaluate or refine a technological solution that reduces the impacts of human activities on natural systems.																	E	E	*						*					E
HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs sand wants.																		E	*	*	*	*	*		*					*
HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.																		*	*						*					
Disciplinary Core Ideas																														
PS1.A Structure and Properties of Matter																					E									
PS1.B Chemical Reactions										E											E									
PS2.B Types of Interactions	*			*	*	*						E		*																
PS3.A Definitions of Energy	*	*	*			*	*					*					*			E										
PS3.B Conservation of Energy and Energy Transfer		E					*	*		E	*	*	*	E		E	*	E		*					*	*	*			
PS3.C Relationship Between Energy and Forces							*			*		*	*	E						E										
PS3.D Energy in Chemical Processes										*	E		*					*					E							

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PS4.A Wave Properties	*						*		*																					
LS1.C Organization for Matter and Energy Flow in Organisms																			*			E	E							
LS2.A Interdependent Relationships in Ecosystems																						E		*						
LS2.B Cycle of Matter and Energy Transfer in Ecosystems																			*			E								
ESS3.A Natural Resources													*					*	*					E	*					*
ESS3.B Natural Hazards																														
ESS3.C Human Impacts on Earth Systems												*	*					*	*						*			E	*	*
ESS3.D Global Climate Change													*					E	*						*			E	*	*
ETS1.A Defining and Delimiting Engineering Problems												*	*				*	*	*	*					*	E	*			*
ETS1.B Developing Possible Solutions								*				*	*				*	*	*	*					*	E	*			E
ETS1.C Optimizing the Design Solution								*				E	*				E			*						E				E
Crosscutting Concepts																														
Patterns			*	*	*		*		*		*		*	*	*	*		*		*			*	*		*		*		
Cause and Effect	*		*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*		*	*	*		*	*		*	*	*
Scale, Proportion, and Quantity						*				*	*	*				*	*	*	*	*					*	*	*		*	*
Systems and System Models			*				*	*	*		*	*	*		*	*	*			*			*		*	*	*			*
Energy and Matter	*						*	*	*	*	*	*	*			*	*	*	*	*		*	*		*	*	*		*	*
Structure and Function								*			*		*	*	*	*	*	*			*						*			*
Stability and Change	*			*			*					*					*	*	*		*	*		*	*			*	*	*
Science and Engineering Practices																														
Asking Questions and Defining Problems		*	*		*								*				*		*						*	*	*	*	*	*
Developing and Using Models				*	*		*	*	*	*	*	*	*	*	*		*		*	*	*		*			*	*	*	*	*
Planning and Carrying Out Investigations			*		*			*		*	*	*		*			*			*	*	*	*	*		*		*		*
Analyzing and Interpreting Data				*	*	*					*	*		*	*		*	*		*		*	*	*	*	*		*	*	*

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Using Mathematics and Computational Thinking			*			*						*						*							*	*			*	*
Constructing Explanations and Designing Solutions								*				*	*				*	*	*				*							*
Engaging in Argument from Evidence			*										*				*	*						*						
Obtaining, Evaluating, and Communicating Information					*									*	*		*	*	*							*		*	*	*