PHYSICS		
HS-PS3-2: Energy		
HS-PS3-2: Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).		
Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.		
Assessment Boundary: N/A		
Evidence Statements: HS-PS3-2		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Developing and Using Models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.	**PS3.A: Definitions of Energy** Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space.	**Energy and Matter** Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems.
Connections to other DCIs in this grade-band: HS.PS1.A ; HS.PS1.B ; HS.PS2.B		
Articulation of DCIs across grade-bands: MS.PS1.A ; MS.PS2.B ; MS.PS3.A ; MS.PS3.C		
NJSLS- ELA: SL.11-12.5		
NJSLS- Math: MP.2, MP.4		

5E Model	
HS-PS3-2: Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).	
Engage Anticipatory Set	Video: Energy Lost When a Ball Bounces (Can be done as classroom demonstration) https://www.youtube.com/watch?v=ZSOxVwTv58Q
	Skatepark Energy Students learn the concepts of kinetic and potential energy as they explore a skateboard simulation. http://betterlesson.com/lesson/638233/skate-park-energy

Exploration Student Inquiry	Skatepark Energy Revisited Students determine how friction and the shape of the ramp impact the transformation of potential into kinetic energy. http://betterlesson.com/lesson/638235/skate-park-energy-revisited Venn Diagram of Kinetic and Potential Energies Students compare and contrast kinetic energy and potential energy by creating a Venn Diagram of the two types of energy.S http://betterlesson.com/lesson/638234/venn-diagram-of-kinetic-and-potential-energies Simple Pendulum Lab https://phet.colorado.edu/en/contributions/view/3591
Explanation **Concepts and Practices**	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): PS3.A: Definitions of Energy Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space.
Elaboration Extension Activity	Swinging Pendulum https://www.teachengineering.org/Activities/view/cub_energy_lesson03_activity2 Related Activities http://www.ck12.org/ngss/high-school-physical-sciences/energy/
Evaluation Assessment Tasks	Assessment Task A: Energy Skate Park- Bar Graph Model http://betterlesson.com/lesson/resource/3218871/energy-skate-park?from=resource_image Assessment Task B: Kinetic and Potential Energy Venn Diagram http://betterlesson.com/lesson/638234/venn-diagram-of-kinetic-and-potential-energies