

PS3: Energy

PS3.A: Definition of Energy



4th Grade	6th Grade	Physical Science	Chemistry	Physics
<p>The faster a given object is moving the more energy it possesses. Energy can be moved from place to place by moving objects or through sound, light, or electric currents.</p>	<p>The faster a given object is moving, the more energy it possesses. Motion energy is properly called kinetic energy; it is proportional to the mass of the 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. Temperature is a measure of the average kinetic 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.</p>	<p>Electrical energy may mean energy stored in a battery or energy transmitted by electric currents.</p> <p>Energy is a quantitative property of a system that depends on the motion and the interaction of matter and radiation within the system. That there is a single quantity called energy 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.</p> <p>At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.</p> <p>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.</p>	<p>At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.</p>	<p>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.</p> <p>At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.</p> <p>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.</p>

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PS3.B: Conservation of Energy and Energy Transfer



K	4th Grade	6th Grade	Physical Science	Chemistry
<p>Sunlight warms the Earth's surface.</p>	<p>Energy is present whenever there are moving objects, sound, light, or heat.</p> <p>When objects collide, energy can be transferred from one object to another, thereby changing their motion.</p> <p>In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.</p> <p>Light also transfers energy from place to place.</p> <p>Energy can also be transferred from place to place by electric currents, which can be used locally to produce motion, sound, heat, or light.</p> <p>The current may have been produced to begin with my transforming the energy of motion into electrical energy.</p>	<p>Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.</p> <p>A system of objects may also contain stored (potential) energy, depending on their relative positions.</p> <p>Temperature is a measure of the average kinetic energy of particles of matter.</p> <p>The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.</p>	<p>Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system.</p> <p>Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.</p> <p>Mathematical expressions, which quantify how stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservations of energy to be used to predict and describe system behavior.</p> <p>The availability of energy limits what can occur in any system.</p> <p>Uncontrolled systems always evolve toward more stable states- that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down).</p>	<p>Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.</p> <p>Uncontrolled systems always evolve toward more stable states- that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down).</p>

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PS3.C: Relationships Between Energy and Energy Forces



Kindergarten	4th Grade	6th Grade	7th Grade	Physics
A bigger push or pull makes things speed up or slow down more quickly.	When objects collide, the contact forces transfer energy so as to change the objects' motion.	When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.	When the motion energy of an object changes, there is inevitably some other change in energy at the same time.	When two objects interacting through a field change relative position, the energy stored in the field is changed.

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PS3.D: Energy in Chemical Processes and Everyday Life



4th Grade	5th Grade	6th Grade	8th Grade
<p>The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use.</p>	<p>The energy release (from) food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water).</p>	<p>The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release energy.</p>	<p>Cellular respiration in plants and animals involve chemical reactions with oxygen that reaction with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.</p>