

Physical Science (Energy Transformations & Law of Conservation of Energy)

Grade 7 Science Grade 7 Science

Start Date: February 17, 2014

End Date : March 28, 2014

Unit Overview	Content Elaborations	Unit Resources
<p>Energy Transformations & Law of Conservation of Energy</p>	<p>A system is separated from its surroundings by a closed system is one that does not interact with its surroundings. Energy can get into or out of a closed system. Most systems are open systems. Energy can be transferred into or out of an open system. If energy is lost, it has just transformed or transferred into another form. Examples include ecosystems, the atmosphere, the hydrosphere, and the geosphere.</p>	<ul style="list-style-type: none"> - Textbook Ch. 9 & Ch.10 Section 1 & 2 - Textbook Ch. 20 (Waves) - Gizmo: Energy Conversions - Gizmo: Energy Conversions in a System - Discovery Education Video: The Law of Conservation of Energy - Discovery Education Video: Multiple clips demonstrating various energy transformations
	<p>When energy transfers to a large system, it may be difficult to track the energy (energy that is transformed into thermal energy and released into the surroundings). Some systems dissipate less energy than others, leaving more energy available for work.</p>	
	<p>Mechanical energy is transferred when a force acts between objects. The amount of energy transferred increases as the distance over which the force acts increases. This energy transfer (work) stops when the objects no longer move.</p>	
	<p>Vibrations cause wave-like disturbances that transfer energy from one place to another through a material (medium) in which to travel. The medium moves temporarily away from its original undisturbed position. Mechanical waves are classified as transverse or longitudinal based on the direction of movement of the medium.</p>	
	<p>Waves can be described by their speed, wavelength, amplitude, and frequency. The speed of a wave upon the material, decreases with increasing wavelength, and increases with the frequency and the loudness increases with amplitude. Waves that require a medium and can travel through a vacuum, they can travel through a medium.</p>	

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	<p>constant speed through a particular material as long as it is uniform of the wave depends on the nature of the material (e.g., waves travel through a uniform medium, as the frequency (f) of the wave is increased, the wavelength decreases. The mathematical representation is $v_{wave} = \lambda f$.</p> <p>Heat is thermal energy transferred between objects and travels from warmer to cooler objects. Thermal energy can be transferred when moving atoms or molecules. Thermal energy can be transferred by means of thermal currents in air, water or other fluids. Warmer material with less density rises, while cooler material with more density sinks. Thermal energy can be transferred in a process called convection. Thermal energy also can be transferred by the waves can be transformed back into thermal energy. Technology (e.g., virtual simulations, satellite imagery) is used to demonstrate the transfer of thermal energy on the surface of the Earth.</p> <p>An electric circuit exists when an energy source (e.g., battery, generator, light bulb, motor) in a closed circuit. The energy source transfers energy to the circuit. Electric potential is a measure of the potential electrical energy per unit charge. The energy source does not create electrical energy. When charges reach an electrical device, energy can be transformed into other forms of energy. The voltage drops after this energy transfer, but the charges continue to flow. When charges stop flowing and energy is not transferred. Current is the rate at which charges flow. Current is measured with an ammeter. The degree to which current is opposed in a circuit is called resistance. The greater the resistance, the lower the current. The resistance of a wire depends on the length of the wire and the diameter of the wire. Electrical devices are connected in series or parallel. As the number of devices in a series loop increases, the current in the loop decreases. In a parallel circuit, the current in each branch are the same as they would be if each loop were the only loop in the circuit. Use Ohm's Law to evaluate the energy transfers, resistance, current, and voltage in electrical circuits.</p>	
<p>Unit Vocabulary</p> <p>Energy Transformation Conversion</p>	<p>Enduring Understandings (Big Ideas)</p> <p>Energy can be transformed or transferred</p>	<p>Connections</p> <p>Energy Skate Park</p>

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<p>Matter Mass Kinetic Energy Potential Energy Gravitational Potential Energy Mechanical Energy Thermal Energy Chemical Energy Electrical Energy Sound Energy Radiant Energy (Light) Nuclear Energy Fusion Fission Law of Conservation of Energy Friction Closed System Open System Efficient Radiation Convection Conduction Circuit Vibration Speed Wavelength Amplitude Frequency Transverse Longitudinal</p>	<p>but is never lost.</p>	
	<p>Energy can be transferred through a variety of ways.</p>	
	<p>When energy is transferred from one system to another, the quantity of energy before transfer equals the quantity of energy after transfer. When energy is transformed from one form to another, the total amount of energy remains the same.</p>	
	<p>Mechanical energy can be transferred when objects push or pull on each other over a distance.</p>	
	<p>Thermal energy can be transferred through radiation, convection and conduction.</p>	
	<p>Electrical energy transfers when an electrical source is connected in a complete electrical circuit to an electrical device.</p>	

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Standards

OH_Academic_Content_Standards - Science (2011) - Grade 7

Strand PS Physical Science

Topic PS.1 This topic focuses on the empirical evidence for the arrangements of atoms on the Periodic Table of Elements, conservation of mass and energy, transformation and transfer of energy.

Content Statement PS.1.2 Energy can be transformed or transferred but is never lost.

PS.1.2.a When energy is transferred from one system to another, the quantity of energy before transfer equals the quantity of energy after transfer. When energy is transformed from one form to another, the total amount of energy remains the same.

Content Statement PS.1.3 Energy can be transferred through a variety of ways.

PS.1.3.a Mechanical energy can be transferred when objects push or pull on each other over a distance.

PS.1.3.b Electromagnetic waves transfer energy when they interact with matter.

PS.1.3.c Thermal energy can be transferred through radiation, convection and conduction.

PS.1.3.d Electrical energy transfers when an electrical source is connected in a complete electrical circuit to an electrical device.

Student Assessment	Unit Reflection
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Energy Transformations & Law of Conservation of Energy

Content	Skills	Assessment
<p>A. Law of Conservation of Energy</p> <p>B. Energy Transformations</p>	<p>A. Law of Conservation of Energy</p> <ol style="list-style-type: none"> 1. Describe energy transformations within a closed system 2. Describe energy transformations within an open system 3. Define/describe the Law of Conservation of energy <p>B. Energy Transformations</p> <ol style="list-style-type: none"> 1. Describe how energy can transfer from one form to another 2. Describe how energy transfers through waves 3. Describe how energy transfers through vibrations 4. Describe the processes by which heat transfers 5. Describe the processes by which mechanical energy transfers 6. Create a complete circuit 	

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	7. Trace energy transfers within a circuit	
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