

**Connecticut Science Physics  
Contents Standards Mapping**

© Boardworks 2009

Physics	Boardworks High School Physics Presentation
<b>Grade 9 - Strand I: Energy Transformations</b>	
D 1. Describe the effects of adding energy to matter in terms of the motion of atoms and molecules, and the resulting phase changes.	Changing State Particles in Action
D 2. Explain how energy is transferred by conduction, convection and radiation.	Conduction and Convection Radiation
D 3. Describe energy transformations among heat, light, electricity and motion.	Energy Transfers
D 4. Explain the relationship among voltage, current and resistance in a simple series circuit.	Current and Potential Difference Current, Voltage and Resistance
D 5. Explain how electricity is used to produce heat and light in incandescent bulbs and heating elements.	Energy Transfers
D 6. Describe the relationship between current and magnetism.	Magnetism, Current and Force
D 7. Explain how heat is used to generate electricity.	Fossil Fuels
D 8. Describe the availability, current uses and environmental issues related to the use of fossil and nuclear fuels to produce electricity.	Fossil Fuels Nuclear Fission
<i>D 9. Describe the availability, current uses and environmental issues related to the use of hydrogen fuel cells, wind and solar energy to produce electricity.</i>	-
<b>Physics</b>	
<b>Motion and Forces</b>	
When forces are balanced, no acceleration occurs; thus an object continues to move at a constant speed or stays at rest.	Newton's First Law
The law $F = ma$ is used to solve motion problems that involve constant forces.	Newton's Second Law
When one object exerts a force on a second object, the second object always exerts a force of equal magnitude and in the opposite direction.	Newton's Third Law
Applying a force to an object perpendicular to the direction of its motion causes the object to change direction.	Newton's Second Law
Circular motion requires the application of a constant force directed toward the center of the circle.	Circular Motion
<i>Newton's laws are not exact, but provide very good approximations unless an object is small enough that quantum effects become important.</i>	-
<b>Conservation of Energy and Momentum</b>	
Kinetic energy can be calculated by using the formula $E = (1/2)mv^2$ .	Kinetic Energy
Changes in gravitational potential energy near Earth can be calculated by using the formula (change in potential energy) = $mgh$ .	Gravitational and Potential Energy

Momentum is calculated as the product $mv$ .	Momentum
Momentum is a separately conserved quantity different from energy.	Conservation of Energy Conservation of Momentum
An unbalanced force on an object produces a change in its momentum.	Momentum Newton's Second Law
The principles of conservation of momentum and energy can be used to solve problems involving elastic and inelastic collisions.	Conservation of Energy Conservation of Momentum
<b>Heat and Thermodynamics</b>	
<i>Heat flow and work are two forms of energy transfer between systems.</i>	–
<i>The work done by a heat engine that is working in a cycle is the difference between the heat flow into the engine at high temperature and the heat flow out at a lower temperature.</i>	–
The internal energy of an object includes the energy of random motion of the object's atoms and molecules. The greater the temperature of the object, the greater the energy of motion of the atoms and molecules that make up the object.	Particles in Action
<i>Most processes tend to decrease the order of a system over time, so that energy levels eventually are distributed more uniformly.</i>	–
<b>Waves</b>	
Waves carry energy from one place to another.	Waves
Transverse and longitudinal waves exist in mechanical media, such as springs and ropes, and in the Earth as seismic waves.	Longitudinal Waves Transverse Waves Waves
Wavelength, frequency and wave speed are related.	Longitudinal Waves Transverse Waves Waves
Sound is a longitudinal wave whose speed depends on the properties of the medium in which it propagates.	Longitudinal Waves Sound
Radio waves, light and X-rays are different wavelength bands in the spectrum of electromagnetic waves, the speed of which in a vacuum is approximately $3 \times 10^8$ m/s, and less when passing through other media.	Electromagnetic Waves
Waves have characteristic behaviors, such as interference, diffraction, refraction and polarization.	Diffraction Interference Polarization Reflection Refraction Superposition and Interference
Beats and the Doppler Effect result from the characteristic behavior of waves.	Doppler Effect
<b>Electric and Magnetic Phenomena</b>	

The voltage or current in simple direct current (DC) electric circuits constructed from batteries, wires, resistors and capacitors can be predicted using Ohm's law.	Calculating Resistance Current and Potential Difference Current, Voltage and Resistance Series and Parallel Circuits
<i>Any resistive element in a DC circuit dissipates energy, which heats the resistor.</i>	–
<i>The power in any resistive circuit element can be calculated by using the formula <math>Power = I^2R</math>.</i>	–
<i>Charged particles are sources of electric fields and are subject to the forces of the electric fields from other charges.</i>	–
Magnetic materials and electric currents (moving electric charges) are sources of magnetic fields and are subject to forces arising from the magnetic fields of other sources.	Magnetism, Current and Force
Changing magnetic fields produce electric fields, thereby inducing currents in nearby conductors.	Magnetism, Current and Force
<i>Plasmas, the fourth state of matter, contain ions, or free electrons or both and conduct electricity.</i>	–