Virginia Science Grades 9-12
Curriculum Standards

PHYSICAL SCIENCE	Boardworks High School Physics Presentation
Standard PS.6 - The student will investigate and understand states and forms of energy and how energy is transferred and transformed. Key concepts include	
a) potential and kinetic energy;	
differentiate between potential and kinetic energy.	Gravitational and Potential Energy Kinetic Energy
use diagrams or concrete examples to compare relative amounts of potential and kinetic energy.	Gravitational and Potential Energy Kinetic Energy
b) mechanical, chemical, and electrical energy; and	
design an investigation or create a diagram to illustrate energy transformations.	Energy Transfers
c) heat, light, and sound.	
identify and give examples of common forms of energy.	Energy Transfers
Standard PS.7 - The student will investigate and understand temperature scales, heat, and heat transfer. Key concepts include	
a) Celsius and Kelvin temperature scales and absolute zero;	
distinguish between heat and temperature.	–
compare and contrast Celsius and Kelvin temperature scales and describe absolute zero.	–
b) phase change, freezing point, melting point, boiling point, vaporization, and condensation;	
illustrate and explain the effect of the addition or subtraction of heat energy on the motion of molecules.	Particles in Action
analyze a time/temperature graph of a phase change experiment to determine the temperature at which the phase change occurs (freezing point, melting point, or boiling point).	Changing State Particles in Action
c) conduction, convection, and radiation, and	
compare and contrast conduction, convection, and radiation and provide and explain common examples.	Conduction and Convection Radiation
d) applications of heat transfer (heat engines, thermostats, refrigeration, and heat pumps).	
explain, in simple terms, how the principle of heat transfer applies to heat engines, thermostats, and refrigerators and heat pumps.	Conduction and Convection

design an investigation from a testable question related to heat transfer. The investigation may be a complete experimental design or may focus on systematic observation, description, measurement, and/or data collection and analysis.	–
Standard PS.8 - The student will investigate and understand characteristics of sound and technological applications of sound waves. Key concepts include	
a) wavelength, frequency, speed, and amplitude;	
model a compression (longitudinal) wave and diagram, label, and describe the basic components: wavelength, compression, rarefaction, and frequency.	Longitudinal Waves Sound Waves
determine the relationship between frequency and wavelength.	Longitudinal Waves Transverse Waves Waves
b) resonance;	–
c) the nature of mechanical waves; and	
analyze factors that determine the speed of sound through various materials and interpret graphs and charts that display this information.	–
d) technological applications of sound.	
describe technological applications of sound waves and generally how each application functions.	–
design an investigation from a testable question related to sound. The investigation may be a complete experimental design or may focus on systematic observation, description, measurement, and/or data collection and analysis.	–
Standard PS.9 - The student will investigate and understand the nature and technological applications of light. Key concepts include	
a) the wave behavior of light (reflection, refraction, diffraction, and interference);	
design an investigation to illustrate the behavior of visible light - reflection and refraction. Describe how reflection and refraction occur.	Diffraction Reflection Refraction
describe the wave theories of light.	–
model a transverse wave and draw and label the basic components. Explain wavelength, amplitude, and frequency.	Transverse Waves Waves
b) images formed by lenses and mirrors; and	Lenses
c) the electromagnetic spectrum.	
compare the various types of electromagnetic waves in terms of wavelength, frequency, and energy.	Electromagnetic Waves Gamma Rays

describe an everyday application of each of the major forms of electromagnetic energy.	Electromagnetic Waves Gamma Rays X-Rays
Standard PS.10 - The student will investigate and understand scientific principles and technological applications of work, force, and motion. Key concepts include	
a) speed, velocity, and acceleration;	
make measurements to calculate the speed of a moving object.	Acceleration Displacement, Velocity and Acceleration Speed and Velocity
apply the concepts of speed, velocity, and acceleration when describing motion.	Acceleration Speed and Velocity
explain how force, mass, and acceleration are related.	Newton's Second Law
differentiate between mass and weight.	Mass and Weight
b) Newton's laws of motion;	
identify situations that illustrate each Law of Motion.	Newton's First Law Newton's Second Law Newton's Third Law
c) work, force, mechanical advantage, efficiency, and power; and	
apply the concept of mechanical advantage to test and explain how a machine makes work easier.	–
make measurements to calculate the work done on an object.	Work
make measurements to calculate the power of an object.	Power
solve basic problems given the following formulas: Speed = distance/time (s = d/t) Force = mass × acceleration (F = ma) Work = force × distance (W = Fd) Power = work/time (P = W/t).	Newton's Second Law Power Speed and Velocity Work
d) applications (simple machines, compound machines, powered vehicles, rockets, and restraining devices).	
explain how the concepts of work, force, and motion apply to car safety technology, machines, and rockets.	Power Speed and Velocity Work