South Carolina High School Physics
Learning Standards Mapping

PHYSICS	Boardworks High School Physics Presentation
Standard P-2: The student will demonstrate an understanding of the principles of force and motion and relationships between them.	
P-2.1 Represent vector quantities (including displacement, velocity, acceleration, and force) and use vector addition.	Displacement, Velocity and Acceleration Momentum Speed and Velocity Vectors and Scalars
P-2.2 Apply formulas for velocity or speed and acceleration to one and two-dimensional problems.	Acceleration Displacement, Velocity and Acceleration Speed and Velocity
P-2.3 Interpret the velocity or speed and acceleration of one and two-dimensional motion on distance-time, velocity-time or speed-time, and acceleration-time graphs.	Displacement, Velocity and Acceleration Newton's First Law
P-2.4 Interpret the resulting motion of objects by applying Newton's three laws of motion: inertia; the relationship among net force, mass, and acceleration (using F = ma); and action and reaction forces.	Circular Motion Newton's First Law Newton's Second Law Newton's Third Law
P-2.5 Explain the factors that influence the dynamics of falling objects and projectiles.	Friction Newton's First Law Projectiles
P-2.6 Apply formulas for velocity and acceleration to solve problems related to projectile motion.	Projectiles
P-2.7 Use a free-body diagram to determine the net force and component forces acting upon an object.	Newton's First Law Newton's Second Law
P-2.8 Distinguish between static and kinetic friction and the factors that affect the motion of objects.	Friction
P-2.9 Explain how torque is affected by the magnitude, direction, and point of application of force.	–
P-2.10 Explain the relationships among speed, velocity, acceleration, and force in rotational systems.	Circular Motion
Standard P-3: The student will demonstrate an understanding of the conservation, transfer, and transformation of mechanical energy.	
P-3.1 Apply energy formulas to determine potential and kinetic energy and explain the transformation from one to the other.	Conservation of Energy Gravitational and Potential Energy

P-3.2 Apply the law of conservation of energy to the transfer of mechanical energy through work.	Conservation of Energy Energy Transfers Work
P-3.3 Explain, both conceptually and quantitatively, how energy can transfer from one system to another (including work, power, and efficiency).	Conservation of Energy Energy Transfers Power Work
P-3.4 Explain, both conceptually and quantitatively, the factors that influence periodic motion.	–
P-3.5 Explain the factors involved in producing a change in momentum (including impulse and the law of conservation of momentum in both linear and rotary systems).	Changes in Momentum Momentum
P-3.6 Compare elastic and inelastic collisions in terms of conservation laws.	Changes in Momentum
Standard P-4: The student will demonstrate an understanding of the properties of electricity and magnetism and the relationships between them	
P-4.1 Recognize the characteristics of static charge and explain how a static charge is generated.	Static Electricty
P-4.2 Use diagrams to illustrate an electric field (including point charges and electric field lines).	Magnetism, Current and Force
P-4.3 Summarize current, potential difference, and resistance in terms of electrons.	Current and Potential Difference Current, Voltage and Resistance
P-4.4 Compare how current, voltage, and resistance are measured in a series and in a parallel electric circuit and identify the appropriate units of measurement.	Series and Parallel Circuits
P-4.5 Analyze the relationships among voltage, resistance, and current in a complex circuit by using Ohm's law to calculate voltage, resistance, and current at each resistor, any branch, and the overall circuit.	Calculating Resistance Current, Voltage and Resistance Factors Affecting Resistance 2
P-4.6 Differentiate between alternating current (AC) and direct current (DC) in electrical circuits.	Types of Current
P-4.7 Carry out calculations for electric power and electric energy for circuits.	Electrical Power
P-4.8 Summarize the function of electrical safety components (including fuses, surge protectors, and breakers).	–
P-4.9 Explain the effects of magnetic forces on the production of electrical currents and on current carrying wires and moving charges.	Magnetism, Current and Force Motors
P-4.10 Distinguish between the function of motors and generators on the basis of the use of electricity and magnetism by each.	Magnetism, Current and Force Motors
P-4.11 Predict the cost of operating an electrical device by determining the amount of electrical power and electrical energy in the circuit.	–
Standard P-5: The student will demonstrate an understanding of the properties and behaviors of mechanical and electromagnetic waves.	

P-5.1 Analyze the relationships among the properties of waves (including energy, frequency, amplitude, wavelength, period, phase, and speed).	Electromagnetic Waves Longitudinal Waves Transverse Waves Waves
P-5.2 Compare the properties of electromagnetic and mechanical waves.	Electromagnetic Waves Longitudinal Waves Transverse Waves Waves
P-5.3 Analyze wave behaviors (including reflection, refraction, diffraction, and constructive and destructive interference).	Interference Reflection Refraction Superposition and Interference
P-5.4 Distinguish the different properties of waves across the range of the electromagnetic spectrum.	Electromagnetic Waves X-rays
P-5.5 Illustrate the interaction of light waves with optical lenses and mirrors by using Snell's law and ray diagrams.	Lenses Reflection Refraction
P-5.6 Summarize the operation of lasers and compare them to incandescent light.	–
Standard P-6: The student will demonstrate an understanding of the properties and behaviors of sound.	
P-6.1 Summarize the production of sound and its speed and transmission through various media.	Sound
P-6.2 Explain how frequency and intensity affect the parts of the sonic spectrum.	Sound
P-6.3 Explain pitch, loudness, and tonal quality in terms of wave characteristics that determine what is heard.	Sound
P-6.4 Compare intensity and loudness.	Sound
P-6.5 Apply formulas to determine the relative intensity of sound.	–
P-6.6 Apply formulas in order to solve for resonant wavelengths in problems involving open and closed tubes.	–
P-6.7 Explain the relationship among frequency, fundamental tones, and harmonics in producing music.	–
P-6.8 Explain how musical instruments produce resonance and standing waves.	Interference Standing Waves
P-6.9 Explain how the variables of length, width, tension, and density affect the resonant frequency, harmonics, and pitch of a vibrating string.	–
Standard P-7: The student will demonstrate an understanding of the properties and behaviors of light and optics.	
P-7.1 Explain the particulate nature of light as evidenced in the photoelectric effect.	The Photoelectric Effect

P-7.2 Use the inverse square law to determine the change in intensity of light with distance.	–
P-7.3 Illustrate the polarization of light.	Polarization
P-7.4 Summarize the operation of fiber optics in terms of total internal reflection.	Reflection
P-7.5 Summarize image formation in microscopes and telescopes (including reflecting and refracting).	Lenses
P-7.6 Summarize the production of continuous, emission, or absorption spectra.	Observing Line Spectra
P-7.7 Compare color by transmission to color by reflection.	–
P-7.8 Compare color mixing in pigments to color mixing in light.	–
P-7.9 Illustrate the diffraction and interference of light.	Diffraction
P-7.10 Identify the parts of the eye and explain their function in image formation.	–
Standard P-8: The student will demonstrate an understanding of nuclear physics and modern physics.	
P-8.1 Compare the strong and weak nuclear forces in terms of their roles in radioactivity.	–
P-8.2 Compare the nuclear binding energy to the energy released during a nuclear reaction, given the atomic masses of the constituent particles.	–
P-8.3 Predict the resulting isotope of a given alpha, beta, or gamma emission.	Types of Radiation
P-8.4 Apply appropriate procedures to balance nuclear equations (including fusion, fission, alpha decay, beta decay, and electron capture).	Nuclear Fission Nuclear Fusion Types of Radiation
P-8.5 Interpret a representative nuclear decay series.	–
P-8.6 Explain the relationship between mass and energy that is represented in the equation E = mc2 according to Einstein's special theory of relativity.	Nuclear Fission
P-8.7 Compare the value of time, length, and momentum in the reference frame of an object moving at relativistic velocity to those values measured in the reference frame of an observer by applying Einstein's special theory of relativity.	–
Standard P-9: The student will demonstrate an understanding of the principles of fluid mechanics.	
P-9.1 Predict the behavior of fluids (including changing forces) in pneumatic and hydraulic systems.	–
P-9.2 Apply appropriate procedures to solve problems involving pressure, force, volume, and area.	–
P-9.3 Explain the factors that affect buoyancy.	–
P-9.4 Explain how the rate of flow of a fluid is affected by the size of the pipe, friction, and the viscosity of the fluid.	–
P-9.5 Explain how depth and fluid density affect pressure.	–
P-9.6 Apply fluid formulas to solve problems involving work and power.	–
P-9.7 Exemplify the relationship between velocity and pressure by using Bernoulli's principle.	–
Standard P-10: The student will demonstrate an understanding of the principles of thermodynamics.	
P-10.1 Summarize the first and second laws of thermodynamics.	–

P-10.2 Explain the relationship among internal energy, heat, and work.	–
P-10.3 Exemplify the concept of entropy.	–
P-10.4 Explain thermal expansion in solids, liquids, and gases in terms of kinetic theory and the unique behavior of water.	Changing State
P-10.5 Differentiate heat and temperature in terms of molecular motion.	–
P-10.6 Summarize the concepts involved in phase change.	Changing State
P-10.7 Apply the concepts of heat capacity, specific heat, and heat exchange to solve calorimetry problems.	Calorimetry
P-10.8 Summarize the functioning of heat transfer mechanisms (including engines and refrigeration systems).	Conduction and Convection Radiation