

**North Carolina Physics Grade 9-12
Learning Objectives Mapping**

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PHYSICS	Boardworks High School Physics Presentations
Competency Goal 2: The learner will build an understanding of linear motion.	
2.01 Analyze velocity as a rate of change of position:	
Average velocity.	Displacement, Velocity and Acceleration Speed and Velocity
Instantaneous velocity.	Displacement, Velocity and Acceleration Speed and Velocity
2.02 Compare and contrast as scalar and vector quantities:	
Speed and velocity.	Displacement, Velocity and Acceleration Speed and Velocity Vectors and Scalars
Distance and displacement.	Displacement, Velocity and Acceleration Vectors and Scalars
2.03 Analyze acceleration as rate of change in velocity.	Acceleration Displacement, Velocity and Acceleration
2.04 Using graphical and mathematical tools, design and conduct investigations of linear motion and the relationships among position, average velocity, instantaneous velocity, acceleration, and time.	Acceleration Displacement, Velocity and Acceleration Speed and Velocity
Competency Goal 3: The learner will build an understanding of two dimensional motion including circular motion.	
3.01 Analyze and evaluate projectile motion in a defined frame of reference.	Projectiles
3.02 Design and conduct investigations of two-dimensional motion of objects.	Projectiles
3.03 Analyze and evaluate independence of the vector components of projectile motion.	Projectiles
3.04 Evaluate, measure, and analyze circular motion.	Circular Motion
3.05 Analyze and evaluate the nature of centripetal forces.	Circular Motion
3.06 Investigate, evaluate and analyze the relationship among centripetal force, centripetal acceleration, mass, velocity and radius.	Circular Motion Displacement, Velocity and Acceleration
Competency Goal 4: The learner will develop an understanding of forces and Newton's Laws of Motion.	
4.01 Determine that an object will continue in its state of motion unless acted upon by a net outside force (Newton's First Law of Motion, The Law of Inertia).	Newton's First Law

4.02 Assess, measure and calculate the conditions required to maintain a body in a state of static equilibrium.	Newton's First Law
4.03 Assess, measure, and calculate the relationship among the force acting on a body, the mass of the body, and the nature of the acceleration produced (Newton's Second Law of Motion).	Newton's Second Law
4.04 Analyze and mathematically describe forces as interactions between bodies (Newton's Third Law of Motion).	Newton's Third Law
4.05 Assess the independence of the vector components of forces.	Momentum Vectors and Scalars
4.06 Investigate, measure, and analyze the nature and magnitude of frictional forces.	Friction
4.07 Assess and calculate the nature and magnitude of gravitational forces (Newton's Law of Universal Gravitation).	–
Competency Goal 5: The learner will build an understanding of impulse and momentum.	
5.01 Assess the vector nature of momentum and its relation to the mass and velocity of an object.	Momentum
5.02 Compare and contrast impulse and momentum.	–
5.03 Analyze the factors required to produce a change in momentum.	Changes in Momentum
5.04 Analyze one-dimensional interactions between objects and recognize that the total momentum is conserved in both collision and recoil situations.	–
5.05 Assess real world applications of the impulse and momentum, including but not limited to, sports and transportation.	–
Competency Goal 6: The learner will develop an understanding of energy as the ability to cause change.	
6.01 Investigate and analyze energy storage and transfer mechanisms:	
Gravitational potential energy.	Energy Transfers Gravitational and Potential Energy
Elastic potential energy.	–
Thermal energy.	–
Kinetic energy.	Energy Transfers Kinetic Energy
6.02 Analyze, evaluate, and apply the principle of conservation of energy.	Conservation of Energy
6.03 Analyze, evaluate, and measure the transfer of energy by a force.	
Work.	Work
Power.	Power
6.04 Design and conduct investigations of:	
Mechanical energy.	Work
Power.	Power

Competency Goal 7: The learner will develop an understanding of wave motion and the wave nature of sound and light.	
7.01 Analyze, investigate, and evaluate the relationship among the characteristics of waves:	
Wavelength.	Transverse Waves Waves
Frequency.	Transverse Waves Waves
Period.	Transverse Waves Waves
Amplitude.	Transverse Waves Sound Waves
<i>7.02 Describe the behavior of waves in various media.</i>	–
7.03 Analyze the behavior of waves at boundaries between media:	
Reflection, including the Law of Reflection.	Reflection
Refraction, including Snell's Law.	Refraction
7.04 Analyze the relationship between the phenomena of interference and the principle of superposition.	Interference Superposition and Interference
7.05 Analyze the frequency and wavelength of sound produced by a moving source (the Doppler Effect).	Doppler effect
Competency Goal 8: The learner will build an understanding of static electricity and direct current electrical circuits.	
8.01 Analyze the nature of electrical charges.	
Investigate the electrical charging of objects due to transfer of charge.	Static Electricity
Investigate the conservation of electric charge.	–
Analyze the relationship among force, charge and distance summarized in Coulomb's law.	–
8.02 Analyze and measure the relationship among potential difference, current, and resistance in a direct current circuit.	Current and Potential Difference Current, Voltage and Resistance
8.03 Analyze and measure the relationship among current, voltage, and resistance in circuits.	
Series.	Current, Voltage and Resistance Series and Parallel Circuits
Parallel.	Current, Voltage and Resistance Series and Parallel Circuits
Series-parallel combinations.	Current, Voltage and Resistance Series and Parallel Circuits
8.04 Analyze and measure the nature of power in an electrical circuit.	Electrical Power