Science **Brunswick School Department**

Physics: Honors

One and Two Dimensional Kinematics (Including Vectors)

Essential Understandings	▪ Conceptual: o The reoccurring fundamental principles elaborated in physics have uses and implications in every dimension of modern life. o Physics seeks to analyze and understand every system as a demonstration of the cause-effect relationship. ▪ Computational: o Physics quantifies each variable of a system in order to describe, analyze and understand it. o A variety of problem solving techniques make use of a system's quantities to investigate the conceptual relationships evidenced within the system. o Numerical problem solving is an essential component in developing a clear understanding of the conceptual relationships identified within any system.
Essential Questions	▪ What is the difference between distance and displacement? ▪ How is acceleration a rate of a rate? ▪ How do scalars and vectors compare and contrast? ▪ Why is the path of any projectile parabolic? ▪ How does launch angle determine height and range?
Essential Knowledge	▪ Instantaneous velocity is the average velocity as the time interval approaches zero. ▪ Acceleration due to gravity is one of the only constant accelerations. ▪ Vectors can represent any quantity with magnitude and direction. ▪ In projectile motion, the horizontal and the vertical components of position, velocity and acceleration are considered independently.
Vocabulary	▪ Terms: o kinematics, displacement, velocity, instantaneous velocity, acceleration, free fall, vector, unit vectors, relative motion, projectile motion
Essential Skills	▪ Use the equations of motion to solve complex numerical problems. ▪ Solve free fall problems using motion equations. ▪ Add vectors graphically. ▪ Add vectors using components. ▪ Describe acceleration, velocity, displacement and position using vectors. ▪ Solve motion problems using vectors. ▪ Use trigonometry to solve two dimensional motion problems. ▪ Determine the range and height of a projectile.

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Related Maine Learning Results	Science and Technology A. Unifying Themes A1. Systems Students apply an understanding of systems to explain and analyze man-made and natural phenomena. a. Analyze a system using the principles of boundaries, subsystems, inputs, outputs, feedback, or the system's relation to other systems and design solutions to a system problem. A3. Constancy and Change Students identify and analyze examples of constancy and change that result from varying types and rates of change in physical, biological, and technological systems with and without counterbalances. C. The Scientific and Technological Enterprises C2. Understandings About Science and Technology Students explain how the relationship between scientific inquiry and technological design influences the advancement of ideas, products, and systems. a. Provide an example that shows how science advances with the introduction of new technologies and how solving technological problems often impacts new scientific knowledge. b. Provide examples of how creativity, imagination, and a good knowledge base are required to advance scientific ideas and technological design. c. Provide examples that illustrate how technological solutions to problems sometimes lead to new problems or new fields of inquiry.

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Related Maine Learning Results	D. The Physical Setting D4. Force and Motion Students understand that the laws of force and motion are the same across the universe. a. Describe the contribution of Newton to our understanding of force and motion, and give examples of and apply Newton's three laws of motion and his theory of gravitation. b. Explain and apply the ideas of relative motion and frame of reference. c. Describe the relationship between electric and magnetic fields and forces, and give examples of how this relationship is used in modern technologies. d. Describe and apply characteristics of waves including wavelength, frequency, and amplitude. e. Describe and apply an understanding of how waves interact with other waves, and with materials including reflection, refraction, and absorption. f. Describe kinetic energy (the energy of motion), potential energy (dependent on relative position), and energy contained by a field (including electromagnetic waves) and apply these understandings to energy problems.
Sample Lessons And Activities	▪ Read the text book and complete the examples presented ▪ Individually answer conceptual questions and solve problems ▪ Collectively discuss the answers and solutions in class ▪ Discuss real world examples of concepts presented in the textbook and encountered in the real world ▪ Pasco Data Studio Motion Match laboratory ▪ Design and build a projectile launcher and calculate its range
Sample Classroom Assessment Methods	▪ Homework assignments. ▪ Assess understanding in classroom discussions. ▪ Laboratory reports ▪ Written formative and summative assessments with real world conceptual questions and numerical problems
Sample Resources	▪ Publications: o Physics, second edition - James S. Walker ▪ Videos: o Mechanical Universe Video Series ▪ Other Resource: o Companion Website: http://physics.prenhall.com/walker o Physics Demonstrations in Mechanics