



Physics Curriculum Bundle #2

Title	 	Suggested Dates
Kinematics in two dimensions		09/13-10/01 (15 Days)

Big Idea/Enduring Understanding	Guiding Questions
The motion of objects in two dimensions can be analyzed through separate perpendicular components.	How can we describe motion in two dimensions?

The resources included here provide teaching examples and/or meaningful learning experiences to address the District Curriculum. In order to address the TEKS to the proper depth and complexity, teachers are encouraged to use resources to the degree that they are congruent with the TEKS and research-based best practices. Teaching using only the suggested resources does not guarantee student mastery of all standards. Teachers must use professional judgment to select among these and/or other resources to teach the district curriculum.

Knowledge & Skills with Student Expectations	Specificity & Examples	Suggested Resources (Read the note above)
Phy.4 Science concepts. The student knows and applies the laws governing motion in a variety of situations. The student is expected to: 4F identify and describe motion relative to different frames of reference.	Including <ul style="list-style-type: none"> • Analyze motion with respect to a specified origin • Analyze motion with respect to objects moving with constant velocity. 	Relative velocity website – http://www.glenbrook.k12.il.us/gbssci/phys/Class/vectors/u311f.html Suggested Equipment – projectile launcher, air rockets, photogates, stopwatches, motion detector, meter stick, graphing software, ballistics cart
Phy.4 Science concepts. The student knows and applies the laws governing motion in a variety of situations. The student is expected to: 4A generate and interpret graphs and charts describing different types of motion, including the use of real-time technology such as motion detectors or photogates;	--- given a description of two dimensional motion, sketch a graph <ul style="list-style-type: none"> • Position-time • Velocity-time • Acceleration-time 	
Phy.4 Science concepts. The student knows and applies the laws governing motion in a variety of situations. The student is expected to: 4C analyze and describe accelerated motion in two dimensions using equations, including projectile and	Understand rotational kinematics. <i>a. Describe the relationships between the concepts and equations used for translational motion and those used for rotational motion.</i> <i>b. Define qualitatively: angular displacement, angular velocity, and angular acceleration.</i>	Horizontal Projection Lab – predicting range of flat projectile based on measured launch velocity using stopwatch or photogate. (Lab – , Quiz – phys_1_flatprojectilelabquiz) Angled Projection Lab – use projection at arbitrary angles

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<p>circular examples;</p>	<p><i>c. Complete computations including angular displacement, angular velocity, angular acceleration, tangential acceleration, and centripetal (radial) acceleration.</i></p> <p><i>d. Use examples to illustrate differences between tangential acceleration and centripetal (radial) acceleration.</i></p> <p><i>e. Explain why a net force (called centripetal) is required in order for an object to move in a circular path. CCRS</i></p> <p>Understand the concept of torque.</p> <p><i>a. Describe the concept of torque and compute torque values for various situations.</i></p> <p><i>b. Describe the concept of moment of inertia and compute moment of inertia values for various objects.</i></p> <p><i>c. Perform calculations using Newton's Second Law of Motion as applied to rotation. CCRS</i></p> <p>Understand angular momentum.</p> <p><i>a. Describe the concept of angular momentum.</i></p> <p><i>b. Describe changes in angular velocity when moment of inertia changes. CCRS</i></p> <p>Including --- Projectile</p> <ul style="list-style-type: none"> • concentrate on horizontally launched projectiles and freefall • Resolving 2-D motion into independent motions • Flat projectiles <ul style="list-style-type: none"> Including <ul style="list-style-type: none"> ○ Range ○ Time of flight • Angled projectiles <ul style="list-style-type: none"> Including <ul style="list-style-type: none"> ○ Determine time of flight and range ○ Relation between range and angle of projection 	<p>to determine optimal angle. (phys_1_ProjectileMotion)</p> <p>Physlets website – http://webphysics.davidson.edu/physlet_resources/semester1/index.html</p>
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	<ul style="list-style-type: none"> • Circular motion determine period, speed and acceleration • Pre-AP: <ul style="list-style-type: none"> ○ Include range equation ○ include projectiles with vertical component ○ Rotational kinematics 	
<p>1 The student conducts investigations, for at least 40% of instructional time, using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom.</p> <p>1A demonstrate safe practices during laboratory and field investigations</p>		
<p>1 The student conducts investigations, for at least 40% of instructional time, using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom.</p> <p>1B demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.</p>		
<p>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p>		

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<p>2A know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;</p>		
<p>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p> <p>2B know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories;</p>		
<p>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p> <p>2C know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but may be subject to change as new areas of science and new technologies are developed;</p>		
<p>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p> <p>2D distinguish between scientific hypotheses and scientific theories</p>		
<p>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p> <p>2E design and implement investigative procedures, including making observations, asking well-defined questions, formulating testable hypotheses,</p>		

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<p>identifying variables, selecting appropriate equipment and technology, and evaluating numerical answers for reasonableness</p>		
<p>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p> <p>2F demonstrate the use of course apparatus, equipment, techniques, and procedures, including, triple beam balances, clamps, dynamics demonstration equipment, slotted and hooked lab masses, power supply, stopwatches, trajectory apparatus, carbon paper, graph paper, protractors, metric rulers, meter sticks, scientific calculators, graphing technology, computers, ballistic carts or equivalent, spools of nylon thread or string.2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p>		
<p>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p> <p>2G use a wide variety of additional course apparatus, equipment, techniques, materials, and procedures as appropriate such as ripple tank with wave generator, wave motion rope, micrometer, caliper, radiation monitor, computer, ballistic pendulum, electroscope, inclined plane, optics bench, optics kit, pulley with table clamp, resonance tube, ring stand screen, four inch ring, stroboscope, graduated cylinders, and ticker timer;</p>		
<p>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p> <p>2H make measurements with accuracy and precision and record data using scientific notation and</p>		

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International System (SI) units;		
<p>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p> <p>2I identify and quantify causes and effects of uncertainties in measured data;</p>		
<p>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p> <p>2J organize and evaluate data and make inferences from data, including the use of tables, charts, and graphs;</p>		
<p>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p> <p>2K communicate valid conclusions supported by the data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;</p>		
<p>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</p> <p>2L express and manipulate relationships among physical variables quantitatively, including the use of graphs, charts, and equations.</p>		
<p>3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.</p> <p>3A in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and</p>		

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<p>observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student</p>		
<p>3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.</p> <p>3B communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials</p>		
<p>3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.</p> <p>3C draw inferences based on data related to promotional materials for products and services</p>		
<p>3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.</p> <p>3D explain the impacts of the scientific contributions of a variety of historical and contemporary scientists on scientific thought and society</p>		
<p>3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.</p> <p>3E research and describe the connections between physics and future careers</p>		
<p>3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.</p> <p>3F express and interpret relationships symbolically in accordance with accepted theories to make predictions and solve problems mathematically,</p>	<p>Understand how vectors are used to represent physical quantities. CCRS</p> <p><i>a. State several examples of scalar quantities.</i></p> <p><i>b. State several examples of vector quantities.</i></p> <p><i>c. Convert a numerical vector quantity (magnitude and direction) into a graphical vector representation. CCRS</i></p>	

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<p>including problems requiring proportional reasoning and graphical vector addition</p>	<p>Demonstrate knowledge of vector mathematics using a graphical representation. CCRS</p> <p><i>a. Resolve a vector quantity (magnitude and direction) into perpendicular components using paper, a ruler, and a protractor.</i></p> <p><i>b. Add and subtract various vectors using paper, a ruler, and a protractor. CCRS</i></p> <p>Demonstrate knowledge of vector mathematics using a numerical representation. CCRS</p> <p><i>a. Resolve a numerical vector quantity (magnitude and direction) into perpendicular components using trigonometric functions and a calculator.</i></p> <p><i>b. Add and subtract various vectors using trigonometric functions and a calculator. CCRS</i></p>	
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