

Physics

Teacher: Master Map

Month	Content and Essential Questions	Skills/Standards	Assessment/Standards	Resources
September 2003	<p>Introduction to physics</p> <p>Why is physics important to learn? Why is mathematics the language of physics? Why is it important to communicate in physics?</p> <p>Mathematical review: significant figures and error analysis scientific notation metric system of measurement</p> <p>Kinematics-general</p> <p>How can we describe motion in the world around us?</p> <p>displacement and distance velocity and speed acceleration</p> <p>graphical representation of motion in 1 dimension</p> <p>mathematical representation of motion in 1 dimension--constant velocity and constant acceleration cases</p> <p>Kinematics-Free fall</p>	<p>Use scientific notation and units correctly in all calculations.</p> <p>Identify and quantify sources of error</p> <p>5.1d An object in linear motion may travel with a constant velocity or with acceleration.</p> <p>Students should be able to:</p> <p>Distinguish between displacement and distance, velocity and speed.</p> <p>Describe motion in words and represent with graphs and vice versa.</p> <p>Solve for velocity, displacement or time, for constant velocity problems.</p> <p>Solve for velocity, displacement, time or acceleration.</p> <p>5.1f An object in free fall accelerates due to</p>	<p>Describe how the different areas of physics apply to an object or activity of interest</p> <p>Homework/classwork: identifying the significant figures, using scientific notation, choosing reasonable units and converting units.</p> <p>Quiz on the above</p> <p>Test: kinematics-word problems (my own) multiple choice (Regents, Test Wizard)</p> <p>Describe motion in class. Act out motion described graphically.</p> <p>Lab: Velocity: measure velocity on track, graph results, and describe the motion</p> <p>Home and classwork: calculating kinematic variables, interpreting and drawing graphs problem solving</p> <p>Lab: free fall--measuring the acceleration due to gravity. What are the important variables?</p>	<p>Honors text: Serway and Faughn, Holt Physics, 2000</p> <p>Regent text: Zitzwitz et al., Glencoe physics, 1999</p> <p>Wizard Test Maker</p> <p>Velocity lab handouts-original work</p> <p>Nursery Rhyme graphs (physics teacher conference)</p> <p>Lab handout-free fall (MacGinitie)</p>

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	free fall and the acceleration due to gravity	the force of gravity Solve for time, velocity or displacement for free fall.		
October 2003	How can we describe motion in 2 dimensions? How can we predict motion in 2 dimensions? Vectors and vector addition and subtraction Vector components Vector solutions for total displacement, velocity or acceleration relative velocities projectile motion-horizontal -same level, at an angle -different level at an angle (H only)	5.1a Measured quantities can be classified as either vector or scalar. 5.1iv 5.1 vi A vector may be resolved into perpendicular components. 5.1f The path of a projectile is the result of the simultaneous effect of horizontal and vertical components of its motion 5.1g A projectile's time of flight is dependent upon the vertical component of its motion 5.1 h The horizontal displacement of a projectile is dependent upon the horizontal component of its motion and its time of flight. Students should be able to: Understand vector representation Add and subtract vectors both algebraically and graphically Find vector components, or their resultant Solve relative velocity problems Solve projectile motion problems	Homework and classwork: Relative velocity problems, projectile motion problems Quiz and Test: vector addition, subtraction, and vectors to analyze motion in 2 dimensions (word problems, multiple choice) Lab: Vector orienteering -measuring displacement, and finding equivalent vector sum. Lab: Projectile motion -predicting and measuring the angle which produces the maximum range Honors extension: calculating the angle required to hit a target and testing it.	Honors text: Serway and Faughn, Holt Physics 2000 Regents text: Zitzewitz et al., Glencoe Physics, 1999 Test Wizard Vector orienteering handout (MacGinitie) Projectile motion lab handout: Mini-launcher instruction manual
November 2003	Forces: Questions: What causes motion? What are forces? What are the types of forces in nature?	5.1 i Newton's first Law-The inertia of an object is directly proportional to its mass 5.2j When the Net force on a system is 0, the system is in equilibrium Students should be able to:	Classwork: Sketching, presenting examples of dynamic equilibrium Explaining demo: atwood machine. (H only) Using dynamic equilibrium to calculate terminal velocities	Honors text: Serway and Faughn, Holt Physics, 2000 Regents text: Zitzewitz et al, Glencoe Physics, 1999 Nasa website on terminal velocities:

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	<p>How do Newton's 3 laws apply to real life situations?</p> <p>Content:</p> <p>Force definition Newton's first law- static equilibrium, dynamic equilibrium Newton's second law Newton's third law</p>	<p>Draw free body diagrams. Find forces acting on a body in equilibrium.</p> <p>5.1k Newton's Second Law-An unbalanced force causes a mass to accelerate.</p> <p>Students should be able to: Draw free body diagrams. Solve for force or acceleration for a body not in equilibrium.</p>	<p>Explaining demo: push pin in water (terminal velocity)</p> <p>Lab: Spring force lab (static equilibrium, spring force model-Hooke's law)</p> <p>Quiz on Newton's Laws-solving word problems, drawing free body diagrams, multiple choice</p> <p>Writing friction problem for comic</p> <p>Test on Newton's Laws and friction, gravitational and spring forces models, solving word problems, drawing free body diagrams, multiple choice.</p>	<p>www.lerc.nasa.gov/WWW/K-12/airplane/termv.html</p> <p>Freebody (computer program)</p> <p>STANYS demos-atwood machine, car hanging on a slant.</p> <p>Comic on friction--dog chewing off table leg.</p>
December 2003	<p>Impulse and Momentum</p> <p>How can we predict the results of interactions?</p> <p>Define Impulse Define Momentum Impulse Momentum Theorem Conservation of Momentum</p>	<p>I.15 5.1 p The impulse imparted to an object causes a change in momentum</p> <p>I.18 5.1r Momentum is conserved in a closed system.</p> <p>Students should be able to: Solve for impulse, momentum, and or change in momentum. Calculate final or initial velocities of colliding or exploding bodies.</p>	<p>Classwork: Develop Impulse Momentum Theorem based on experience Explain operation of safety <i>devices for sports, cars, based on IM theorem.</i></p> <p>Homework, Classwork: Solving word problems involving impulse/momentum</p> <p>Explaining Demo: Analysis of Astroblaster demo Explaining Demo: Analysis of colliding PASCARS</p> <p>Lab: Impulse Momentum Honors: Testing the relationship Ft vs v Regents: Testing the relationship m vs. v</p> <p>Quiz on Impulse and Momentum</p>	<p>Honors text Regents text</p> <p>Sports figures video worksheet.</p> <p>Intuit website on physics in movies: Matrix</p> <p>Next year: National Institute of safety video, Understanding car crashes, and worksheets.</p> <p>Impulse Momentum lab (MacGinitie, 2003).</p> <p>Test Wizard</p> <p>Pre break Review: Movie illustrating physics examples-student worksheets</p>

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January 2004	<p>Questions: What is work? What is power? What is energy? How are they related? How can we observe and describe transmission of various forms of energy? How is energy conservation revealed in the real world?</p> <p>Work Power Potential energy Gravitational potential energy Kinetic Energy Internal Energy Work Energy Theorem Conservation of Energy</p>	<p>Standards I.16 II.1-II.9</p> <p>Students should be able to: Calculate work, power, PE, KE, Describe changes in energy Describe when mechanical energy is and is not conserved. Apply energy analysis to real world problems.</p> <p>Midterm Benchmarks: Students should be able to construct a complete response using equations, substitution of variables with units, and solve correctly to obtain a result with correct units, that is expressed in 3 significant figures in scientific notation. Students should be able to: solve constant velocity and constant acceleration problems. Draw force diagrams, and solve for force or acceleration using Newton's laws. Use vector addition, subtraction and components to solve relative velocity and projectile motion problems. Use Impulse and Momentum to predict the outcome of collisions and explosions. Use the work energy theorem and conservation of energy to describe energy changes and solve problems.</p>	<p>classwork: predict work, power definitions derive PE, KE using work definition Impulse Momentum lab as example of change in energy</p> <p>classwork, homework: word problems using work, power word problems using PE, KE for sports</p> <p>Explaining Demo: Graphing PE and KE vs time for real systems (e.g. pendulum, bouncing ball)</p> <p>Test: Work, power, energy, conservation of mechanical energy (word problems, regents type multiple choice)</p> <p>Midterm: constructed response and multiple choice modeled on Regents exam</p>	<p>Honors text Regents text</p> <p>National Institute of safety video? Scientific American: Anti gravity article with questions.</p>
February 2004	<p>Content: Elastic potential energy</p>	<p>5.1m The elongation or compression of a</p>	<p>Class, homework: identifying changes in energy using the work energy theorem for</p>	<p>Honors Text Regents Text</p>

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	<p>Circular motion: Essential questions How is circular motion like and unlike linear motion? What causes circular motion?</p> <p>Circular Motion: concepts</p> <p>tangential velocity period centripetal acceleration centripetal force Honors only: angular velocity and angular acceleration</p> <p>Universal Gravitation:</p> <p>Concepts: Law</p>	<p>spring depends on the nature of the spring and the magnitude of the applied force.</p> <p>5.1n Centripetal force is the net force which produces centripetal acceleration.</p> <p>5.1t Gravitational forces are only attractive.</p>	<p>a spring word problems diagramming energy changes</p> <p>Demo explanations: calculating jump of elastic toy.</p> <p>Lab: bungee jumping egg lab</p> <p>quiz: diagramming PE, KE, Et, word problems and lab</p> <p>Classwork, Homework: Identifying real world examples Drawing velocity and acceleration vectors Identifying forces Calculating velocity, acceleration and forces using word problems.</p> <p>Demo explanations: Calculating tension and predicting escape velocity for water in pail. Calculating normal force and escape velocity for roller coaster etc.</p> <p>Lab: Pendulum lab--measuring the dependence of the period on length Honors extension--collaborating between groups to measure the dependence on mass, angle (none predicted) Honors: optional extension--predicting the height for maximum range for the model roller coaster.</p> <p>Quiz: circular motion: word and multiple choice problems based on above.</p> <p>Classwork, homework, test Calculate force for different m,r,T calculate g for different m,r calculate orbital v,a, T for different m,r</p>	<p>Original problem</p> <p>Adaptation of bungee jumping egg lab from unknown source.</p> <p>Test Wizard, own problems</p> <p>Pendulum lab adapted from Laboratory Investigations.</p> <p>Test Wizard, own problems based on student examples of circular motion</p> <p>Scientific American: "Antigravity" with questions. Glencoe: worksheets--Chapter 8 assessments Earth Science reference tables, and lab packet (Ms. Megello). Orbit lab from Glencoe Physics</p>

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	relation to orbital motion		Regents: optional Orbit Lab	
March 2004	<p>Waves: Questions: What are waves? How are waves generated? How do waves behave in different media?</p> <p>Content: Types (longitudinal, transverse) Examples (spring, string, sound, em) Description (velocity, frequency, wavelength, period) Behaviors (reflection, refraction, diffraction, interference, dispersion, resonance)</p> <p>Sound waves (description, speed, reflection, refraction, diffraction, interference, standing waves, Doppler effect)</p>	<p>IV.1-4.3a An oscillating system produces waves. Students should be able to: Identify examples of waves by type</p> <p>IV.2-4.3b Waves carry energy and information without transferring mass.</p> <p>IV.3-4.3c The model of a wave incorporates characteristics of amplitude, wavelength, frequency, period.</p> <p>IV.11-4.3m When waves of a similar nature meet, the resulting interference may be explained using the principle of superposition.</p> <p>Students should be able to: Calculate velocity, frequency, wavelength or period. Graph and identify wavelength or period and amplitude. Identify nodes and antinodes in a standing wave.</p> <p>IV.4-4.3d Mechanical waves require a material medium through which to travel. Students should be able to: Determine the speed of sound, and use the period of sound to solve problems. Predict the behavior of a reflecting wave. Predict wave interference patterns for open and closed tubes. Identify nodes and antinodes.</p>	<p>Explaining demo: Similarities and differences between pendulum, mass on spring, pencil on wheel rim.</p> <p>Explaining demo: Describe pulse waves on a coiled spring</p> <p>Classwork, Homework: Examples of waves, classified, graphing, word problems.</p> <p>Lab: Waves on a coiled spring. Compare and contrast essay for waves on a coiled spring vs. pendulum.</p> <p>Quiz: on describing waves and wave behavior and pendulum (as example of simple harmonic oscillator).</p> <p>Lab: Sound tube. Compare and contrast essay for waves on a coiled spring vs. waves in a sound tube</p>	<p>Honors text Regents text</p> <p>Waves on a coiled spring lab, modified from lab received from Sheryl Hawks (BHS)</p> <p>Test Wizard, original problems</p> <p>How Things Work: Musical instruments.</p> <p>Scientific American: Sound waves as evidence of cosmic expansion with questions.</p> <p>Sound lab, adapted from...</p>

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	<p>EM waves Optics: law of reflexion index of refraction</p>	<p>IV.10-4.3j The absolute index of refraction is proportional to the speed of a wave.</p> <p>Calculate speed, and or angle of refraction for different media.</p>	<p>Explaining demo: Diffraction through double slit, through crystals.</p> <p>Lab: refraction--finding the angle of refraction for light through lucite.</p> <p>Test: Waves, Sound, Light</p>	<p>Scientific American: What causes a mirage.</p> <p>Refraction lab, adapted from...</p> <p>Wavefront transparencies.</p>
<p>April 2004</p>	<p>Electric fields: What are electric fields? How are electric fields created? Why are electric fields important? How is energy stored in electric fields?</p> <p>Circuits: How do electrical circuits work? How can we predict the behavior of an electrical circuit? How is energy stored in them? How do different circuits perform different jobs?</p>	<p>III.1-5.1t Gravitational forces are only attractive, whereas electrical and magnetic forces can be attractive or repulsive</p> <p>III.2-5.1u The inverse square law applies to electrical and gravitational fields produced by point sources.</p> <p>Students should be able to: Solve for force or field for 2 point charges Drawing electrical fields for point charges, parallel plates</p> <p>III.3-4.1j Energy may be stored in electric or magnetic fields. This energy may be transferred through conductors or space and may be converted to other forms of energy.</p> <p>III.4-4.1m The factors affecting resistance in a conductor are length, cross sectional area, temperature and resistance.</p> <p>Students should be able to:</p>	<p>Homework, classwork: Drawing electric fields, interpreting drawings of electric fields. Solving problems for 2 point charges.</p> <p>Lab: Static electricity.</p> <p>Quiz: Drawing electric fields, field dependence on charge, r.</p> <p>Homework, classwork</p> <p>Lab: Playdough resistors</p>	

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		<p>to its frequency</p> <p>5.3e Mass-energy and charge are conserved at all levels.</p> <p>5.3j The fundamental source of energy in the universe is the conversion of mass into energy</p> <p>Students should be able to: Interpret energy diagrams. Find the energy of a photon absorbed or emitted. Find the quark combination for protons, neutrons. Find the energy released from a unit of mass. Find the equivalent wavelength of a massive particle.</p>	<p>Quiz: standard model</p> <p>Lab: Photoelectric data interpretation.</p>	<p>Lab handout: photoelectric effect data</p>
June 2004	<p>Standard model continued (if necessary)</p> <p>Review:</p> <p>How do equilibrium, conservation, scale and model sum up many of our understanding of the way nature works?</p>		<p>Regents Exam and Final Exam</p>	<p>Star Review book</p>