



Physics Curriculum Bundle #9

Title Waves and Optics	 	Suggested Dates 02/22-03/11 (14 Days)
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Big Idea/Enduring Understanding Properties of waves can be used to understand many natural phenomena.	Guiding Questions How do properties of waves allow us to predict their behavior?
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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)
<p>Phy.7 Science concepts. The student knows the characteristics and behavior of waves. The student is expected to:</p> <p>7D investigate behaviors of waves, including reflection, refraction, diffraction, interference, resonance, and the Doppler effect;</p>	<ul style="list-style-type: none"> • Calculate wave speed through different media • Interference <ul style="list-style-type: none"> ○ Draw or describe interfering wave pulses • Polarization • Ray diagrams <p>Pre-AP</p> <ul style="list-style-type: none"> • Double slit interference- describe and calculate <p>Pre-AP: Snell's law</p> <ul style="list-style-type: none"> • Critical angle • Total internal reflection 	<p>Dan Russell's acoustics website – http://www.kettering.edu/~drussell/demos.html</p>
<p>Phy.7 Science concepts. The student knows the characteristics and behavior of waves. The student is expected to:</p> <p>7E describe and predict image formation as a consequence of reflection from a plane mirror and refraction through a thin convex lens; and</p>	<p>Understand concepts of geometric optics.</p> <p><i>a. Predict the path of a reflected light ray by applying the law of reflection to both diffuse and specular reflection.</i></p> <p><i>b. Define index of refraction. Predict the path of a light ray through a transparent material by application of Snell's Law.</i></p> <p><i>c. Identify convex, concave, and plane mirrors.</i></p> <p><i>d. Identify convex and concave lenses.</i></p> <p><i>e. Discuss qualitatively the images formed by mirrors and single lenses.</i></p> <p><i>f. Discuss qualitatively the images formed by combinations of mirrors and lenses (e.g., telescopes, microscopes,</i></p>	<p>Mirror Lab – forming images with mirrors on an optics bench. (phys_8_MirrorLab)</p> <p>Refraction Lab – Finding index of refraction using Snell's Law. (phys_8_RefractionLab)</p> <p>Lens Lab – forming images with lenses on an optics bench and finding the focal length. (phys_8_LensLab)</p> <p>Optics Applet – http://www.mhhe.com/physsci/physical/giambattista/optics/optics.html</p>

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	<p>cameras). CCRS</p> <p>Including</p> <ul style="list-style-type: none"> • Lenses <ul style="list-style-type: none"> ○ Ray diagrams ○ Thin lens equation ○ Magnification • Mirrors <ul style="list-style-type: none"> ○ Ray diagrams ○ Thin lens equation ○ Magnification 	<p>Suggested Equipment – laser pointer, lenses, mirrors, diffraction gratings, optics bench, protractor, prisms, glass blocks, polarized lens.</p>
<p>Phy.7 Science concepts. The student knows the characteristics and behavior of waves. The student is expected to:</p> <p>7F describe the role of wave characteristics and behaviors in medical and industrial applications.</p>	<p>Including</p> <ul style="list-style-type: none"> • Ultrasound (sonograms) • Doppler weather • Police radar • Sonar/Echolocation • Radio/TV communications 	<p>Suggested Equipment – spectral tube, spectroscope, light ray box, plane mirror, light meter.</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>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</p>		

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<p>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> <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>		

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<p>2E design and implement investigative procedures, including making observations, asking well-defined questions, formulating testable hypotheses, 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 clamps, slotted and hooked lab masses, mirrors, convex lenses, power supply, ring clamps, ring stands, stopwatches, tuning forks, graph paper, polarized film, prisms, protractors, 90-degree rod clamps, metric rulers, spring scales, knife blade switches, Celsius thermometers, meter sticks, scientific calculators, graphing technology, computers, resonance tubes, spools of nylon thread or string, rolls of white craft paper, slinky springs, wave motion ropes, and laser pointers</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>		

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<p>2H make measurements with accuracy and precision and record data using scientific notation and International System (SI) units;</p>		
<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</p>		

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evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student		
<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, including problems requiring proportional reasoning and</p>		

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graphical vector addition		
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