



## Physics Curriculum Bundle #11

Title	 	Suggested Dates
Magnetism		04/18-05/06 (14 Days)

Big Idea/Enduring Understanding	Guiding Questions
Electricity and Magnetism are related phenomena.	How are electric and magnetic fields created?

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><b>Phy.5 Science concepts. The student knows the nature of forces in the physical world. The student is expected to:</b></p> <p><b>5A</b> research and describe the historical development of the concepts of gravitational, electromagnetic, weak nuclear, and strong nuclear forces;</p>	<p><b>Including</b></p> <ul style="list-style-type: none"> <li>• Research development of magnetic fields/forces</li> <li>• Compare and contrast with electric fields</li> </ul>	<p>History of Physics Website – <a href="http://web.mit.edu/redingtn/www/netadv/hist.html">http://web.mit.edu/redingtn/www/netadv/hist.html</a></p>
<p><b>Phy.5 Science concepts. The student knows the nature of forces in the physical world. The student is expected to:</b></p> <p><b>5D</b> identify examples of electric and magnetic forces in everyday life;</p>	<p>Relate electricity and magnetism to everyday life.</p> <p><i>a. Explain how an electric motor works. State which electromagnetic laws or principles govern the workings of a motor.</i></p> <p><i>b. Explain how an electric generator works. State which electromagnetic laws or principles govern the workings of a generator.</i></p> <p><i>c. Make quantitative predictions of whether or not a circuit breaker will “trip” when a variety of electrical appliances are in use. CCRS</i></p> <ul style="list-style-type: none"> <li>• Describe everyday applications Such as                             <ul style="list-style-type: none"> <li>○ Electric motors</li> <li>○ MRI</li> <li>○ Cat Scan</li> <li>○ Aurora Borealis/Australis</li> </ul> </li> </ul>	<p>Electric Power website – <a href="http://www.glenbrook.k12.il.us/gbssci/phys/Class/circuits/u9l2d.html">http://www.glenbrook.k12.il.us/gbssci/phys/Class/circuits/u9l2d.html</a></p> <p>Electricity &amp; Magnetism Simulations – <a href="http://phet.colorado.edu/new/simulations/index.php?cat=Electricity Magnets and Circuits">http://phet.colorado.edu/new/simulations/index.php?cat=Electricity Magnets and Circuits</a></p> <p>Suggested Equipment – bar magnets, horseshoe magnets, iron filings, compasses, jumping ring apparatus, simple motor.</p>
<p><b>Phy.5 Science concepts. The student knows the nature of forces in the physical world. The student is expected to:</b></p>	<p>Understand magnetic fields and their relationship to electricity.</p> <p><i>a. Describe the force experienced by a moving electric</i></p>	<p>Properties of magnetic materials – types of magnetic poles, magnetic and nonmagnetic materials. (phys_11_PropMagnMat)</p>

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<p><b>5G</b> investigate and describe the relationship between electric and magnetic fields in applications such as generators, motors, and transformers; and</p>	<p><i>charge in a magnetic field.</i>  <i>b. Describe moving electrical charge as the source of magnetic fields.</i>  <i>c. Describe Faraday’s Law and Lenz’s Law.</i>  <i>d. Describe the source of magnetism in matter.</i>  <i>e. State the law of magnetic poles. CCRS</i></p> <p><b>Including</b></p> <ul style="list-style-type: none"> <li>• Describe magnetic field lines.</li> <li>• Relate changing electric fields to changing magnetic fields</li> </ul> <p><b>Pre-AP</b></p> <ul style="list-style-type: none"> <li>• Relate force to charge speed and magnetic fields</li> <li>• Describe the flow of magnetic field through a surface as flux</li> <li>• Explain Faraday’s law of induction.</li> <li>• Determine the direction of induced current using Lenz’s law.</li> <li>• Explain why a rotating loop in a magnetic field produces alternating current.</li> </ul>	<p>Magnetic Field Lab – mapping magnetic fields around magnets with compass. (phys_11_MagFieldLab)</p> <p>Magnetic Field from Current Lab – deflection of compass due to current in wire. (phys_11_ElectroMagnWrksh)</p> <p>Simple Motor Lab – build simple motor with battery, wire, and magnet. (phys_11_SimpleMotorLab)</p> <p>Faraday’s Law Lab – Genecon to generate steady voltage. (phys_11_FaradaysLaw)</p>
<p><b>Phy.7 Science concepts. The student knows the characteristics and behavior of waves. The student is expected to:</b></p> <p><b>7C</b> compare characteristics and behaviors of transverse waves, including electromagnetic waves and the electromagnetic spectrum, and characteristics and behaviors of longitudinal waves, including sound waves;</p>	<p>Understand the difference between transverse and longitudinal waves.  <i>a. Describe the motion of the medium as compared to the wave motion for both transverse and longitudinal waves. CCRS</i></p> <p>Understand the properties and behavior of sound waves.  <i>a. Describe the properties and behavior of sound including compressions, rarefactions, and travel through various media.</i>  <i>b. Compare and contrast sound and electromagnetic waves in terms of wave speed, wave type, wavelength, frequency, and medium.</i>  <i>c. Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler Effect). CCRS</i></p> <p>Know the electromagnetic spectrum.  <i>a. Discuss the regions of the electromagnetic spectrum, including radio waves, microwaves, infrared, visible, ultraviolet, x-rays, and gamma rays.</i>  <i>b. Discuss visible light as part of the electromagnetic</i></p>	

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	<p><i>spectrum. Emphasize that light is an electromagnetic wave.</i></p> <p><i>c. Recognize that electromagnetic waves are transverse waves and travel at the speed of light through a vacuum.</i></p> <p><i>d. Compare and contrast transmission, reflection, and absorption of radiation. CCRS</i></p> <ul style="list-style-type: none"> <li>• Light is a transverse wave consisting of oscillating perpendicular electric and magnetic fields</li> </ul> <p>Pre-AP:</p> <ul style="list-style-type: none"> <li>• Calculate Doppler shift</li> </ul>	
<p><b>Phy.8 Science concepts. The student knows simple examples of atomic, nuclear, and quantum phenomena. The student is expected to:</b></p> <p><b>8A</b> describe the photoelectric effect and the dual nature of light;</p>	<p>Understand the wave/particle duality of light.</p> <p><i>a. Describe the behavior of light and why scientists have chosen to model it as both a particle and a wave.</i></p> <p><i>b. Give a practical example that illustrates light acting as a wave. Give a practical example that illustrates light acting as a particle. CCRS</i></p> <p>Including</p> <ul style="list-style-type: none"> <li>• Relations between:             <ul style="list-style-type: none"> <li>○ Intensity / number of photons &amp; photoelectric current</li> <li>○ Photon frequency &amp; kinetic energy of electrons</li> </ul> </li> <li>• Threshold frequency &amp; work function</li> </ul>	<p>Photoelectric Effect Applet – <a href="http://lectureonline.cl.msu.edu/~mmp/kap28/PhotoEffect/photo.htm">http://lectureonline.cl.msu.edu/~mmp/kap28/PhotoEffect/photo.htm</a></p> <p>Quantum Simulations – <a href="http://phet.colorado.edu/new/simulations/index.php?cat=Quantum%20Phenomena">http://phet.colorado.edu/new/simulations/index.php?cat=Quantum Phenomena</a></p>
<p><b>1</b> 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><b>1A</b> demonstrate safe practices during laboratory and field investigations</p>		
<p><b>1</b> 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</p>		

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<p><b>in a simulated environment as well as field observations that extend beyond the classroom.</b></p> <p><b>1B</b> demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.</p>		
<p><b>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</b></p> <p><b>2A</b> know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;</p>		
<p><b>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</b></p> <p><b>2B</b> 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><b>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</b></p> <p><b>2C</b> 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><b>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</b></p> <p><b>2D</b> distinguish between scientific hypotheses and scientific theories</p>		
<p><b>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</b></p>		

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<p><b>2E</b> 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><b>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</b></p> <p><b>2F</b> demonstrate the use of course apparatus, equipment, techniques, and procedures, including multimeters (current, voltage, resistance), batteries, clamps, bar magnets, horseshoe magnets, power supply, graph paper, magnetic compasses, resistors, knife blade switches, horseshoe magnets, ballistic carts or equivalent, containers of iron filings, rolls of white craft paper, copper wire,</p>		
<p><b>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</b></p> <p><b>2G</b> 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><b>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</b></p> <p><b>2H</b> make measurements with accuracy and precision and record data using scientific notation and International System (SI) units;</p>		
<p><b>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</b></p>		

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<p><b>2I</b> identify and quantify causes and effects of uncertainties in measured data;</p>		
<p><b>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</b></p> <p><b>2J</b> organize and evaluate data and make inferences from data, including the use of tables, charts, and graphs;</p>		
<p><b>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</b></p> <p><b>2K</b> 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><b>2 The student uses a systematic approach to answer scientific laboratory and field investigative questions.</b></p> <p><b>2L</b> express and manipulate relationships among physical variables quantitatively, including the use of graphs, charts, and equations.</p>		
<p><b>3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.</b></p> <p><b>3A</b> in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical 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>		
<p><b>3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.</b></p> <p><b>3B</b> communicate and apply scientific information extracted from various sources such as current events,</p>		

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news reports, published journal articles, and marketing materials		
<p><b>3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.</b></p> <p>3C draw inferences based on data related to promotional materials for products and services</p>		
<p><b>3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.</b></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><b>3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.</b></p> <p>3E research and describe the connections between physics and future careers</p>		
<p><b>3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.</b></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 graphical vector addition</p>		