



PHYSICS

Principles and Problems

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STANDARDS

PAGE REFERENCES

STATE GOAL 11: Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.

As a result of their schooling students will be able to:

Why This Goal Is Important: The inquiry process prepares learners to engage in science and apply methods of technological design. This understanding will enable students to pose questions, use models to enhance understanding, make predictions, gather and work with data, use appropriate measurement methods, analyze results, draw conclusions based on evidence, communicate their methods and results, and think about the implications of scientific research and technological problem solving.

A. Know and apply the concepts, principles and processes of scientific inquiry.

11.A.5a Formulate hypotheses referencing prior research and knowledge.

Student Edition:

8, 751, 753

MiniLAB 788

Physics Lab 332-333, 364-365

Teacher Wraparound Edition:

AIL 161, 393; CB 9, 39

11.A.5b Design procedures to test the selected hypotheses.

Student Edition:

8-10, 11-14, 15-19

Design Your Own Physics Lab 160-161, 392-393, 532-533

Physics Lab 332-333, 364-365

Teacher Wraparound Edition:

A 9; AIL 161, 393, 533

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11.A.5c Conduct systematic controlled experiments to test the selected hypotheses.	<p>Student Edition: <i>Design Your Own Physics Lab</i> 160-161, 392-393, 532-533 <i>Physics Lab</i> 332-333, 364-365</p> <p>Teacher Wraparound Edition: AIL 161, 393, 533</p>
11.A.5d Apply statistical methods to make predictions and to test the accuracy of results.	<p>Student Edition: 11-12, 19, 38-42, 46-47 <i>Internet Physics Lab</i> 76-77 <i>Share Your Data</i> 21</p> <p>Teacher Wraparound Edition: CT 14, 18</p>
11.A.5e Report, display and defend the results of investigations to audiences that may include professionals and technical experts.	<p>Student Edition: 12-13, 15-19 <i>Internet Physics Lab</i> 20-21, 76-77 <i>Physics Lab</i> 302-303, 580-581, 790-791</p> <p>Teacher Wraparound Edition: AIL 21; CB 12</p>
B. Know and apply the concepts, principles and processes of technological design.	
11.B.5a Identify a design problem that has practical applications and propose possible solutions, considering such constraints as available tools, materials, time and costs.	<p>Student Edition: <i>Future Technology</i> 22, 768, 826 <i>Launch Lab</i> 171, 431, 617, 775 <i>Physics Lab</i> 186-187 <i>Technology and Society</i> 220, 394, 608</p> <p>Teacher Wraparound Edition: ICE 181; PP 213; UA 184; UM 180</p>
11.B.5b Select criteria for a successful design solution to the identified problem.	<p>Student Edition: 10, 213, 761-762, 786 <i>Design Your Own Physics Lab</i> 392-393, 554-555, 660-661 <i>Physics Lab</i> 218-219, 790-791 <i>Technology and Society</i> 220, 450, 716</p> <p>Teacher Wraparound Edition: CD 214; CH 785; PP 213</p>

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<p>11.B.5c Build and test different models or simulations of the design solution using suitable materials, tools and technology.</p>	<p>Student Edition: 9-10, 19 <i>Applying Physics</i> 13, 95 <i>Design Your Own Physics Lab</i> 660-661 <i>Launch Lab</i> 171, 197 <i>Physics Lab</i> 186-187, 218-219, 738-739, 766-767</p> <p>Teacher Wraparound Edition: A 212; UM 4</p>
<p>11.B.5d Choose a model and refine its design based on the test results.</p>	<p>Student Edition: <i>Design Your Own Physics Lab</i> 660-661 <i>How It Works</i> 334, 634, 688, 740 <i>Physics Lab</i> 186-187, 218-219, 580-581, 738-739, 766-767, 790-791</p> <p>Teacher Wraparound Edition: CB 184; TS 220</p>
<p>11.B.5e Apply established criteria to evaluate the suitability, acceptability, benefits, drawbacks and consequences for the tested design solution and recommend modifications and refinements.</p>	<p>Student Edition: 9-10 <i>How It Works</i> 334, 634, 688, 740 <i>Physics Lab</i> 186-187, 218-219, 580-581, 738-739, 766-767, 790-791</p> <p>Teacher Wraparound Edition: AIL 661; UM 599</p>
<p>11.B.5f Using available technology, prepare and present findings of the tested design solution to an audience that may include professional and technical experts.</p>	<p>Student Edition: <i>How It Works</i> 334, 582, 634, 688, 740 <i>Physics Lab</i> 302-303, 580-581, 790-791 <i>Technology and Society</i> 138, 394, 608</p> <p>Teacher Wraparound Edition: AIL 21; CB 12</p>

STANDARDS	PAGE REFERENCES
<p>STATE GOAL 12: Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.</p>	
<p>As a result of their schooling students will be able to:</p>	
<p>Why This Goal Is Important: This goal is comprised of key concepts and principles in the life, physical and earth/space sciences that have considerable explanatory and predictive power for scientists and non-scientists alike. These ideas have been thoroughly studied and have stood the test of time. Knowing and being able to apply these concepts, principles and processes help students understand what they observe in nature and through scientific experimentation. A working knowledge of these concepts and principles allows students to relate new subject matter to material previously learned and to create deeper and more meaningful levels of understanding.</p>	
<p>A. Know and apply concepts that explain how living things function, adapt and change.</p>	
<p>12.A.5a Explain changes within cells and organisms in response to stimuli and changing environmental conditions (e.g., homeostasis, dormancy).</p>	<p>See Glencoe's <i>Biology</i> © 2007.</p>
<p>12.A.5b Analyze the transmission of genetic traits, diseases and defects.</p>	<p>See Glencoe's <i>Biology</i> © 2007.</p>
<p>B. Know and apply concepts that describe how living things interact with each other and with their environment.</p>	
<p>12.B.5a Analyze and explain biodiversity issues and the causes and effects of extinction.</p>	<p>See Glencoe's <i>Biology</i> © 2007.</p>
<p>12.B.5b Compare and predict how life forms can adapt to changes in the environment by applying concepts of change and constancy (e.g., variation within a population increase the likelihood of survival under new conditions).</p>	<p>See Glencoe's <i>Biology</i> © 2007.</p>
<p>C. Know and apply concepts that describe properties of matter and energy and the interactions between them.</p>	
<p>12.C.5a Analyze reactions (e.g., nuclear reactions, burning of fuel, decomposition of waste) in natural and man-made energy systems.</p>	<p>Student Edition: 807-808, 811-814 <i>Applying Physics</i> 317 Teacher Wraparound Edition: CD 803, 807; CH 804; CU 805, 814; RLP 327</p>
<p>12.C.5b Analyze the properties of materials (e.g., mass, boiling point, melting point, hardness) in relation to their physical and/or chemical structures.</p>	<p>Student Edition: 317-318, 323-325, 754-756, 776-781 Teacher Wraparound Edition: CB 318, 321; D 320; RLP 753</p>

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<p>D. Know and apply the concepts that describe force and motion and the principles that explain them.</p>	
<p>12.D.5a Analyze factors that influence the relative motion of an object (e.g., friction, wind shear, cross currents, potential differences).</p>	<p>Student Edition: 72-75, 87-91, 171-176, 236-241, 652-656, 815-816 <i>How It Works</i> 276 <i>Internet Physics Lab</i> 20-21, 76-77 <i>Launch Lab</i> 197 <i>Technology and Society</i> 138, 304</p> <p>Teacher Wraparound Edition: CB 91, 208; IM 238; RLP 70, 570</p>
<p>12.D.5b Analyze the effects of gravitational, electromagnetic and nuclear forces on a physical system.</p>	<p>Student Edition: 72-75, 171-176, 179-185, 546-553, 802-805, 822-823 <i>Extreme Physics</i> 188 <i>Internet Physics Lab</i> 76-77</p> <p>Teacher Wraparound Edition: CB 74, 177; CU 185; PP 802; R 550, 823; TPK 546</p>
<p>E. Know and apply concepts that describe the features and processes of the Earth and its resources.</p>	
<p>12.E.5 Analyze the processes involved in naturally occurring short-term and long-term Earth events (e.g., floods, ice ages, temperature, sea-level fluctuations).</p>	<p>Student Edition: <i>Technology and Society</i> 394</p> <p>Teacher Wraparound Edition: RLP 389</p> <p>Also see Glencoe's <i>Earth Science: Geology, the Environment, and the Universe</i> © 2005.</p>
<p>F. Know and apply concepts that explain the composition and structure of the universe and Earth's place in it.</p>	
<p>12.F.5a Compare the processes involved in the life cycle of stars (e.g., gravitational collapse, thermonuclear fusion, nova) and evaluate the supporting evidence.</p>	<p>See Glencoe's <i>Earth Science: Geology, the Environment, and the Universe</i> © 2005.</p>

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<p>12.F.5b Describe the size and age of the universe and evaluate the supporting evidence (e.g., red-shift, Hubble's constant).</p>	<p>Student Edition: 446 <i>Astronomy Connection</i> 447</p> <p>Also see Glencoe's <i>Earth Science: Geology, the Environment, and the Universe</i> © 2005.</p>
<p>STATE GOAL 13: Understand the relationships among science, technology and society in historical and contemporary contexts.</p> <p>As a result of their schooling students will be able to:</p> <p>Why This Goal Is Important: Understanding the nature and practices of science such as ensuring the validity and replicability of results, building upon the work of others and recognizing risks involved in experimentation gives learners a useful sense of the scientific enterprise. In addition, the relationships among science, technology and society give humans the ability to change and improve their surroundings. Learners who understand this relationship will be able to appreciate the efforts and effects of scientific discovery and applications of technology on their own lives and on the society in which we live.</p> <p>A. Know and apply the accepted practices of science.</p>	
<p>13.A.5a Design procedures and policies to eliminate or reduce risk in potentially hazardous science activities.</p>	<p>Student Edition: <i>Appendix D</i> 918 <i>How It Works</i> 582, 634 <i>Physics Lab</i> 332-333, 580-581, 606-607, 632-633, 790-791 <i>Technology and Society</i> 220</p> <p>Teacher Wraparound Edition: PP 232</p>
<p>13.A.5b Explain criteria that scientists use to evaluate the validity of scientific claims and theories.</p>	<p>Student Edition: 8-10, 11-14, 177-178, 184-185, 437-438, 726-734, 754-759 <i>Extreme Physics</i> 366</p> <p>Teacher Wraparound Edition: CB 184, 446, 730; CD 176, 177; HSS 8; IM 9; PP 762</p>

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<p>13.A.5c Explain the strengths, weaknesses and uses of research methodologies including observational studies, controlled laboratory experiments, computer modeling and statistical studies.</p>	<p>Student Edition: 8-10, 11-13 <i>Internet Physics Lab</i> 76-77 <i>Math Handbook</i> 848-852 <i>Physics Lab</i> 218-219, 302-303, 580-581, 790-791 <i>Problem-Solving Strategies</i> 123, 599, 728</p> <p>Teacher Wraparound Edition: CB 39; D 6; HSS 8; UM 4</p>
<p>13.A.5d Explain, using a practical example (e.g., cold fusion), why experimental replication and peer review are essential to scientific claims.</p>	<p>Student Edition: 177-178, 729-734, 760-761 <i>Future Technology</i> 826 <i>Internet Physics Lab</i> 20-21 <i>Physics Lab</i> 790-791 <i>Technology and Society</i> 608</p> <p>Teacher Wraparound Edition: CB 177, CH 207; PP 16, 213, 762</p>
<p>B. Know and apply concepts that describe the interaction between science, technology and society.</p>	
<p>13.B.5a Analyze challenges created by international competition for increases in scientific knowledge and technological capabilities (e.g., patent issues, industrial espionage, technology obsolescence).</p>	<p>Student Edition: <i>Extreme Physics</i> 366, 792 <i>Future Technology</i> 22, 768, 826 <i>Technology and Society</i> 220, 394, 608</p> <p>Teacher Wraparound Edition: AP 13</p>
<p>13.B.5b Analyze and describe the processes and effects of scientific and technological breakthroughs.</p>	<p>Student Edition: 172-176, 184-185, 698-700, 713, 726-737, 747-759, 760-761, 784-789 <i>Extreme Physics</i> 188, 366, 506, 792 <i>Future Technology</i> 22, 768 <i>How It Works</i> 582, 740</p> <p>Teacher Wraparound Edition: CB 184, 446, 706</p>

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13.B.5c Design and conduct an environmental impact study, analyze findings and justify recommendations.	See Glencoe's <i>Earth Science: Geology, the Environment, and the Universe</i> © 2005.
13.B.5d Analyze the costs, benefits and effects of scientific and technological policies at the local, state, national and global levels (e.g., genetic research, Internet access).	<p>Student Edition: <i>Applying Physics</i> 13, 467 <i>Extreme Physics</i> 792 <i>Future Technology</i> 22, 826 <i>Technology and Society</i> 220, 608</p> <p>Teacher Wraparound Edition: DI 181; PP 213</p>
13.B.5e Assess how scientific and technological progress has affected other fields of study, careers and job markets and aspects of everyday life.	<p>Student Edition: <i>Applying Physics</i> 68, 180, 501, 764 <i>Future Technology</i> 22 <i>How It Works</i> 334, 534, 582, 688 <i>Technology and Society</i> 138, 304, 450, 716</p> <p>Teacher Wraparound Edition: RLC 68, 214, 433, 496, 657, 811</p>