



PHYSICS

Principles and Problems

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STANDARDS	PAGE REFERENCES
I. HISTORY AND NATURE OF SCIENCE	
A. Scientific World View	
The student will understand the nature of scientific ways of thinking and that scientific knowledge changes and accumulates over time.	
<p>1. The student will be able to distinguish among hypothesis, theory and law as scientific terms and how they are used to answer a specific question.</p>	<p>Student Edition: 8-10, 172-176, 184-185, 236-237, 293-295, 326-331, 458-460, 595-599 <i>Physics Lab</i> 186-187</p> <p>Teacher Wraparound Edition: IM 172; QD 175, 597; TPK 293; UM 458</p>
<p>2. The student will be able to explain how scientific and technological innovations as well as new evidence can challenge portions of or entire accepted theories and models including but not limited to cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease and big bang theory.</p>	<p>Student Edition: 171-176, 184-185, 439, 648-649, 726-729, 735-737, 747-759, 760-761; 818-820 <i>Astronomy Connection</i> 447 <i>Extreme Physics</i> 78, 188</p> <p>Teacher Wraparound Edition: CB 184, 321, 446, 543, 809; CH 502; D 648; IM 172, 736; PP 762</p>

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<p>3. The student will recognize that in order to be valid, scientific knowledge must meet certain criteria including that it: be consistent with experimental, observational and inferential evidence about nature; follow rules of logic and reporting both methods and procedures; and be falsifiable and open to criticism.</p>	<p>Student Edition: 8-10, 72-75, 156, 171-176, 236-245, 293-296, 323-331, 748-756, 779-781 <i>Extreme Physics</i> 50, 366, 506 <i>Internet Physics Lab</i> 76-77, 108-109 <i>Physics Lab</i> 136-137, 302-303, 420-421, 580-581, 790-791</p> <p>Teacher Wraparound Edition: A 9; CB 12, 39; CD 176; IM 172</p>
<p>4. The student will explain how traditions of ethics, peer review, conflict and general consensus influence the conduct of science.</p>	<p>Student Edition: 8-10, 172-173, 177-178, 184-185, 437-438, 737, 760-761, 818-821 <i>Extreme Physics</i> 188, 366, 792 <i>Future Technology</i> 826 <i>Technology and Society</i> 220, 608</p> <p>Teacher Wraparound Edition: CB 177, 184, 321, 801; CH 502; IM 172; PP 437</p>
<p>5. The student will recognize that some scientific ideas are incomplete, and opportunity exists in these areas for new advances.</p>	<p>Student Edition: 735-737, 760-765, 802-804, 818-823 <i>Applying Physics</i> 130, 467, 725 <i>Extreme Physics</i> 366, 792 <i>Future Technology</i> 826 <i>Technology and Society</i> 394, 608</p> <p>Teacher Wraparound Edition: IM 736; PP 802</p>
<p>B. Scientific Inquiry The student will design and conduct a scientific investigation.</p>	
<p>1. The student will design and complete a scientific experiment using scientific methods by determining a testable question, making a hypothesis, designing a scientific investigation with appropriate controls, analyzing data, making conclusions based on evidence and comparing conclusions to the original hypothesis and prior knowledge.</p>	<p>Student Edition: 8-10, 11-14 <i>Design Your Own Physics Lab</i> 160-161, 392-393, 532-533, 554-555, 660-661, 824-825 <i>Problem-Solving Strategies</i> 466, 550, 728 <i>Share Your Data</i> 21, 247</p> <p>Teacher Wraparound Edition: AIL 109, 137, 187, 247, 275, 581; CB 39; HSS 8</p>

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<p>2. The student will distinguish between qualitative and quantitative data.</p>	<p>Student Edition: 11-14, 36-37, 43-44, 183-185, 216-217, 257-265, 326-329, 618-625 <i>Design Your Own Physics Lab</i> 554-555 <i>Internet Physics Lab</i> 108-109 <i>Launch Lab</i> 229 <i>Physics Lab</i> 580-581 <i>Technology and Society</i> 138 Teacher Wraparound Edition: CB 12; CH 234; PP 232, 350; RLP 36</p>
<p>3. The student will apply mathematics and models to analyze data and support conclusions.</p>	<p>Student Edition: 4-5, 19, 172-176, 184-185, 412-415, 747-758, 760-761 <i>Example Problem</i> 436 #1, 602 #3, 684 #2 <i>Internet Physics Lab</i> 108-109 <i>Physics Lab</i> 738-739 <i>Problem-Solving Strategies</i> 123, 728 Teacher Wraparound Edition: CD 172; CH 122; CT 123; HSS 754; ICE 602, 684; UM 4, 753</p>
<p>4. The student will identify possible sources of error and their effects on results.</p>	<p>Student Edition: 11-13 <i>Design Your Own Physics Lab</i> 160-161, 392-393, 532-533 <i>Internet Physics Lab</i> 76-77 <i>Physics Lab</i> 186-187, 420-421, 474-475, 606-607, 766-767 Teacher Wraparound Edition: CD 7</p>
<p>5. The student will know that professional scientists and engineers have ethical codes.</p>	<p>Student Edition: <i>Extreme Physics</i> 792 <i>Technology and Society</i> 220, 394, 608 Teacher Wraparound Edition: CU 14; IM 9; PP 16; RLC 811</p>

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<p>6. The student will give examples of how different domains of science use different bodies of scientific knowledge and employ different methods to investigate questions.</p>	<p>Student Edition: <i>Astronomy Connection</i> 447 <i>Biology Connection</i> 159, 273, 322, 500-501 <i>Chemistry Connection</i> 442 <i>Geology Connection</i> 180, 355</p> <p>Teacher Wraparound Edition: CB 441; RLC 180, 319, 360, 433, 461, 496, 522, 657, 702, 811; RLP 442</p>
<p>C. Scientific Enterprise The student will understand the relationship between science and technology and how both are used.</p>	
<p>1. The student will compare and contrast the purposes and career opportunities of engineering, technology and science.</p>	<p>Student Edition: <i>Applying Physics</i> 180, 435 <i>Astronomy Connection</i> 557, 530-531 <i>Extreme Physics</i> 506, 792 <i>How It Works</i> 740</p> <p>Teacher Wraparound Edition: IM 9; RLC 68, 180, 214, 241, 289, 319, 345, 360, 496, 522, 702, 708, 751, 763, 777, 780, 811, 820; RLP 501</p>
<p>2. The student will provide an example of a need or problem identified by science and solved by engineering or technology.</p>	<p>Student Edition: 14, 177-178, 326-327 <i>Applying Physics</i> 180 <i>Extreme Physics</i> 50, 792 <i>Future Technology</i> 22, 476, 556, 768 <i>How It Works</i> 334 <i>Technology and Society</i> 220, 394</p> <p>Teacher Wraparound Edition: CB 344, 354; PP 213, 232; RLP 173, 272</p>

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<p>3. The student will provide an example of how technology facilitates new discoveries and the development of scientific knowledge.</p>	<p>Student Edition: 14, 709-713, 761-765, 784-789, 815-821 <i>Extreme Physics</i> 50, 506 <i>Future Technology</i> 22, 768 <i>Geology Connection</i> 180 <i>Technology and Society</i> 608, 716</p> <p>Teacher Wraparound Edition: CB 9, 809; HSS 346; RLP 725, 816</p>
<p>4. The student will know that technological changes and scientific advances are often accompanied by social, political, environmental and economic changes.</p>	<p>Student Edition: 14, 179-180, 659, 709-712, 784-789 <i>Applying Physics</i> 95 <i>Extreme Physics</i> 792 <i>Future Technology</i> 22 <i>Technology and Society</i> 394, 450, 608, 716</p> <p>Teacher Wraparound Edition: E 10; PP 232; RLP 5, 173, 175, 329</p>
<p>5. The student will recognize that science and technology are influenced by cultural backgrounds and beliefs and by social needs, attitudes, values and limitations.</p>	<p>Student Edition: 171-176, 603-605, 659, 705-712, 761-765, 788-789 <i>Extreme Physics</i> 792 <i>Future Technology</i> 826 <i>How It Works</i> 740 <i>Technology and Society</i> 220, 304, 394, 608, 716</p> <p>Teacher Wraparound Edition: CB 684; RLP 630, 701</p>

STANDARDS	PAGE REFERENCES
<p>D. Historic Perspectives</p>	
<p>The student will recognize the historical and cultural context of scientific endeavors and how they influence each other.</p>	
<p>1. The student will be able to trace the development of a scientific advancement, invention or theory and its impact on society.</p>	<p>Student Edition: 10, 14, 171-176, 184-185, 486-492, 671-678, 698-700, 726-734, 735-737, 752-757, 761-765 <i>Extreme Physics</i> 662 <i>Future Technology</i> 22 <i>How It Works</i> 582 <i>Technology and Society</i> 450, 716 Teacher Wraparound Edition: CB 7, 9, 184, 530; CH 502; E 10; IM 172; RLC 708; RLP 173</p>
<p>2. The student will provide examples of scientific advancements contributed by other civilizations and cultures.</p>	<p>Student Edition: 10, 171-176, 439-440, 549-550, 648, 724-725, 735-737, 752-757, 760-761 <i>Extreme Physics</i> 188, 366, 506 Teacher Wraparound Edition: AP 44; CB 9, 521; PP 6, 494; RLP 173, 487</p>
<p>3. The student will compare and contrast the differences between scientific theories and theories from other bodies of knowledge, and the importance of each in a science discussion.</p>	<p>Student Edition: 10, 171-176, 184-185 <i>Extreme Physics</i> 78, 422, 792 Teacher Wraparound Edition: CB 184; IM 172</p>
<p>II. PHYSICAL SCIENCE</p>	
<p>A. Structure of Matter</p>	
<p>The student will understand the nature of matter including its forms, properties and interactions.</p>	
<p>1. The student will identify protons, neutrons and electrons as the major components of the atom, their mass relative to one another, their arrangement and their charge.</p>	<p>Student Edition: 698-700, 748-756, 760-761, 800, 811-814, 818-820 Teacher Wraparound Edition: CB 757, 801; D 819; HSS 754; IM 752, 818; UM 753</p>

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2. The student will be able to explain the relationship of an element's position on the periodic table to its atomic number and atomic mass.	Student Edition: 801 <i>Appendix D 916</i> Teacher Wraparound Edition: D 804; R 801
3. The student will compare and contrast the properties of an element and its isotopes, and describe how isotopes can be used in research, medicine and industry.	Student Edition: 701, 704, 800-804, 812-814 Teacher Wraparound Edition: CB 809; DI 807; R 801; RLC 811
4. The student will use the periodic table to identify regions, families, groups and periods.	Student Edition: <i>Appendix D 916</i>
5. The student will explain how neutral atoms become ions.	Student Edition: 543-544, 704
6. The student will be able to explain how atoms form compounds through bonding.	See Glencoe's <i>Chemistry: Concepts and Applications</i> © 2005 Student Edition: 129, 130-135, 138-142, 243-246, 302-314, 623-624, 629-636, 680-681
7. The student will compare and contrast the states of matter in terms of interactions between particles.	Student Edition: 323-324, 342-345, 359-360 Teacher Wraparound Edition: AML 330; TPK 359; UA 348
8. The student will differentiate between an atom and a molecule.	See Glencoe's <i>Chemistry: Concepts and Applications</i> © 2005 Student Edition: 52-55, 66-68, 86-89, 140, 170, 174-175
9. The student will differentiate between an element and a compound.	See Glencoe's <i>Chemistry: Concepts and Applications</i> © 2005 Student Edition: 30-31, 134-135, 174-175

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<p>B. Chemical Reactions The student will describe chemical reactions and the factors that influence them.</p>	
<p>1. The student will describe chemical reactions using words and symbolic equations.</p>	<p>See Glencoe's <i>Chemistry: Concepts and Applications</i> © 2005 Student Edition: 190-196, 198-199, 203-205, 208-209, 708-714, 734-735</p>
<p>2. The student will explain the influence of temperature, surface area, agitation and catalysts on the rate of a reaction.</p>	<p>See Glencoe's <i>Chemistry: Concepts and Applications</i> © 2005 Student Edition: 218-223, 676-677, 692-694, 713-714, 730</p>
<p>3. The student will distinguish between a chemical reaction and a nuclear reaction.</p>	<p>Student Edition: 807-812 <i>Future Technology</i> 826 Teacher Wraparound Edition: CD 807; CH 804; CU 814</p>
<p>4. The student will explain how the rearrangement of atoms and molecules in a chemical reaction illustrates conservation of mass.</p>	<p>See Glencoe's <i>Chemistry: Concepts and Applications</i> © 2005 Student Edition: 41-42, 53, 55, 59, 198-199</p>
<p>5. The student will describe how combining acids and bases produces a neutral solution.</p>	<p>See Glencoe's <i>Chemistry: Concepts and Applications</i> © 2005 Student Edition: 516-518, 535, 539-541</p>
<p>C. Energy Transformations The student will understand energy forms, transformations and transfers.</p>	
<p>1. The student will know that potential energy is stored energy and is associated with gravitational or electrical force, mechanical position or chemical composition.</p>	<p>Student Edition: 287-292, 376-380 Teacher Wraparound Edition: CB 287; CU 292; QD 726; TPK 617</p>
<p>2. The student will differentiate between kinetic and potential energy and identify situations where kinetic energy is converted into potential energy and vice versa.</p>	<p>Student Edition: 258-259, 287-290, 293-295, 376-380, 726-732 <i>Launch Lab</i> 285 <i>Physics Lab</i> 302-303 Teacher Wraparound Edition: HSS 288, 296; R 299</p>

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3. The student will differentiate between AC and DC current.	<p>Student Edition: 592, 675-678, 682-685 <i>Physics Lab</i> 686-687</p> <p>Teacher Wraparound Edition: CT 592; CU 678, 685; PP 682; QD 598</p>
4. The student will describe the production, storage and transmission of electricity.	<p>Student Edition: 591-594, 603-605, 675-678, 682-685 <i>Physics Lab</i> 686-687</p> <p>Teacher Wraparound Edition: BA 671; CB 599, 621, 684; CD 675; CT 602; QD 603</p>
5. The student will be able to describe physical and chemical changes in terms of the law of conservation of energy.	<p>Student Edition: 293-295, 297-301, 319-320 <i>Physics Lab</i> 302-303</p> <p>Teacher Wraparound Edition: AIL 303; CB 298; CD 294; HSS 296; QD 295; R 731, 734</p>
6. The student will compare and contrast the amount of energy released through chemical reactions and nuclear fission and fusion.	<p>Student Edition: 811-812 <i>Future Technology</i> 826</p> <p>Teacher Wraparound Edition: CD 807; CH 804; CU 814</p>
7. The student will describe the risks and benefits of fossil fuels, renewable sources and nuclear power as sources of usable energy.	<p>Student Edition: 331, 812-814 <i>Future Technology</i> 826</p> <p>Teacher Wraparound Edition: CT 812; CU 814; PP 330</p>
8. The student will describe applications of the different wavelengths of the electromagnetic spectrum.	<p>Student Edition: 440-442, 708-713, 764-765, 783 <i>Future Technology</i> 476 <i>How It Works</i> 534, 688, 740 <i>Launch Lab</i> 697 <i>Technology and Society</i> 450, 716</p> <p>Teacher Wraparound Edition: CH 785; IM 710; PP 711, 764; RLC 702; UM 706</p>

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9. The student will describe energy, work and power both conceptually and quantitatively.	<p>Student Edition: 258-265, 286-292 <i>Physics Lab</i> 274-275</p> <p>Teacher Wraparound Edition: CB 259; CU 265; QD 287; RLP 260; TPK 266</p>
<p>D. Motion The student will understand the nature of force and motion.</p>	
1. The student will use Newton's three laws of motion to qualitatively and quantitatively describe the interaction of objects.	<p>Student Edition: 93-95, 96-99, 102-103, 150-152, 153-155, 157-159 <i>Design Your Own Physics Lab</i> 160-161 <i>Internet Physics Lab</i> 108-109</p> <p>Teacher Wraparound Edition: BA 102; HSS 104; R 152; RLP 93</p>
2. The student will describe the effect of friction and gravity on the motion of an object.	<p>Student Edition: 72-75, 126-130, 175-176, 179-185 <i>Extreme Physics</i> 506 <i>Internet Physics Lab</i> 76-77 <i>Physics Lab</i> 136-137</p> <p>Teacher Wraparound Edition: BA 126; CB 182; CT 74; IM 72; QD 128, 175; R 129, 130; UA 127</p>
<p>E. Forces of Nature The student will understand the forces of nature and their application.</p>	
1. The student will recognize the factors that affect the presence and magnitude of gravitational, electromagnetic, weak and strong nuclear forces.	<p>Student Edition: 175-176, 182-185, 802, 821-823</p> <p>Teacher Wraparound Edition: CD 176; CB 177; PP 802; R 823</p>

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<p>2. The student will identify the dominant force or forces in a variety of interactions.</p>	<p>Student Edition: 72-75, 87-95, 175-176, 349-351, 546-548, 652-657 <i>Extreme Physics</i> 506 <i>Future Technology</i> 162 <i>How It Works</i> 110, 582 <i>Internet Physics Lab</i> 76-77 <i>Launch Lab</i> 87 <i>Technology and Society</i> 138, 220</p> <p>Teacher Wraparound Edition: AML 73; R 823</p>