



IDAHO
Science Standards – Grades 9-12
***Physics: Principles and Problems* © 2005**

| STANDARDS | PAGE REFERENCES |
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| 648. UNIFYING CONCEPTS OF SCIENCE. | |
| 01. Understand systems, order, and organization. | |
| a. Know the scientific meaning and application of the concepts of system, order, and organization. | SE: 88, 236-237, 319-321, 752-759, 776-781 <i>Applying Physics</i> 317 <i>Future Technology</i> 476 <i>Physics Lab</i> 218-219, 302-303, 790-791 |
| 02. Understand concepts and processes of evidence, models, and explanation. | |
| a. Know that observations and data are evidence on which to base scientific explanations. | SE: 8-9, 175-178, 439, 748-749, 815-820 <i>Physics Lab</i> 108-109, 136-137, 332-333, 532-533, 824-825 |
| b. Use models to explain how things work. | SE: 9, 19, 33, 439, 723, 748-756, 818-820 <i>Launch Lab</i> 171, 431 <i>Physics Lab</i> 186-187, 738-739 |
| c. Develop scientific explanations based on scientific knowledge, logic, and analysis. | SE: 72-75, 126-130, 293-301, 485-489, 573-574, 735-737, 787 <i>Problem-Solving Strategies</i> 123, 550, 629 |
| 03. Understand constancy, change, and measurement. | |
| a. Identify constancy in some concepts in science that do not change with time such as the speed of light. | SE: 177-178, 236-237, 293-295, 326-331, 345, 437-438, 724-725, 802-805 |
| b. Recognize that change occurs in and among systems and change can be measured. | SE: 43-47, 58-66, 147-151, 179-185, 241-242, 344-346, 756, 811-813 <i>MiniLab</i> 8 <i>Physics Lab</i> 108-109 |
| c. Measure in both the metric and customary system. | SE: 5-6, 34-37, 96-99 <i>How It Works</i> 110 <i>Physics Lab</i> 20-21, 48-49, 108-109, 420-421 TWE: IM 12 |
| 04. Understand the theory that evolution is a process that relates to the gradual changes in the universe and of equilibrium as a physical state. | |
| a. Know that the present arises from materials and forms of the past. | SE: 541, 643, 775 <i>Astronomy Connection</i> 466 <i>Extreme Physics</i> 50, 662 <i>Future Technology</i> 22, 826 <i>Technology and Society</i> 220, 450 |
| b. Understand evolution as a series of changes, some gradual and some sporadic, that account for present form and function of objects, organisms, and natural or mechanical systems. | SE: 643, 748-759, 775 <i>Applying Physics</i> 467 <i>Extreme Physics</i> 662 <i>Future Technology</i> 22, 826 <i>Technology and Society</i> 220, 450 |

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| c. Know that equilibrium is a physical state in which forces and changes occur in opposite and offsetting directions. | SE: 95, 211-213 <i>Physics Lab</i> 218-219 <i>Technology and Society</i> 220, 394 TWE: HSS 215 RLC 214 RT 217 |
| 05. Understand concepts of form and function. | |
| a. Know that form refers to function and function refers to form. | SE: 269-272, 788-789 <i>Extreme Physics</i> 792 <i>Future Technology</i> 22 <i>How It Works</i> 276, 582 <i>Technology and Society</i> 304, 394, 450 |
| 649. CONCEPTS OF SCIENTIFIC INQUIRY. | |
| 01. Understand scientific inquiry and develop critical thinking skills. | |
| a. Identify questions and concepts that guide scientific investigations. | SE: 8-10 <i>Launch Lab</i> 31, 57, 313 <i>Physics Lab</i> 76-77, 218-219, 420-421, 532-533, 632-633, 714-715 |
| b. Design and conduct scientific investigations. | SE: 8-10, 15-17 <i>Physics Lab</i> 160-161, 392-393, 532-533, 554-555, 660-661, 824-825 |
| c. Use technology and mathematics to improve investigations and communication. | SE: <i>Physics Lab</i> 20-21, 76-77, 246-247, 824-825 <i>Problem-Solving Strategies</i> 123, 260, 550, 629 |
| d. Formulate and revise scientific explanations and models using logic and evidence. | SE: 9-10, 175-178, 293-295, 748-759, 816-823 <i>MiniLab</i> 702, 813 <i>Physics Lab</i> 136-137, 332-333, 532-533 |
| e. Recognize and analyze alternative explanations and models. | SE: 153-156, 176, 184-185, 432, 486-488, 735, 737, 748-749, 760-761 TWE: CB 801 |
| f. Communicate and defend a scientific argument. | SE: 100-101, 175-176, 216-217, 293-295, 437-438, 573-574, 698-700, 726-729, 735-737, 754-758 |
| g. Know the differences among observations, hypotheses, and theories. | SE: 8-10, 177-178, 352, 486-487, 748-749, 754-756, 776-777, 818-820 <i>Physics Lab</i> 532-533, 790-791 |
| 650. CONCEPTS OF PHYSICAL SCIENCE. | |
| 01. Understand the structure of atoms. | |
| a. Know the function and location of protons, neutrons, and electrons. | SE: 748-749, 752-756, 760-761, 777-779, 800 TWE: CB 543, 699, 757, 801 |
| b. Understand the processes of fission and fusion. | SE: 811-814 <i>Future Technology</i> 826 TWE: UF 803 |
| c. Know the characteristics of isotopes. | SE: 701-704, 801, 809-810 <i>Applying Physics</i> 811 TWE: CT 812 DI 804 |

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| d. Know the basic electrical properties of matter. | SE: 544-545, 777-781 <i>Tables</i> 914 TWE: CB 595, 597 IM 594 PP 603 RLP 596 |
| 02. Understand the structure and function of matter and molecules and their interactions. | |
| a. Know how atoms interact with one another by transferring or sharing electrons. | SE: 781 TWE: CD 777 |
| b. Know how bonds between atoms are created when electrons are shared or transferred to form molecules or ionic substances. | See Glencoe's <i>Chemistry: Concepts and Applications</i> © 2005. |
| c. Know how the physical properties of compounds reflect the nature of the interactions among its molecules. | See Glencoe's <i>Chemistry: Concepts and Applications</i> © 2005. |
| d. Know how solids, liquids, and gases differ in the energy that bonds them together. | SE: 323-324 |
| 03. Understand chemical reactions. | |
| a. Know that chemical reactions may release or consume energy. | TWE: CU 814 RLC 319 |
| b. Know that chemical reactions can occur in time periods that vary from very fast to very slow and that catalysts can affect the rate of a chemical reaction. | See Glencoe's <i>Chemistry: Concepts and Applications</i> © 2005. |
| c. Identify chemical reactions that are occurring all around us. | See Glencoe's <i>Chemistry: Concepts and Applications</i> © 2005. |
| 04. Understand concepts of motion and forces. | |
| a. Know that gravitational force and electrical force are universal forces. | SE: 175-177, 182-183, 549-553 <i>Future Technology</i> 556 TWE: CD 542 CT 184 PP 802 TPK 546 |
| b. Know that objects change their motion only when a net force is applied. | SE: 94-95, 101, 131, 153-155 TWE: CB 92 |
| c. Understand that moving electrical charges produce magnetic forces, and moving magnets produce electrical forces. | SE: 648-649, 653, 655-656, 671-672, 675-678, 679-681 TWE: TPK 652 |
| 05. Understand that the total energy in the universe is constant. | |
| a. Understand that energy can be transferred but it can neither be destroyed nor created. | SE: 293-295, 298 <i>Launch Lab</i> 285 <i>Physics Lab</i> 302-303 |
| b. Know that energy can be classified as either potential energy, kinetic energy, or energy contained by a field. | SE: 287, 288-289, 291-293, 563-564, 577-579, 644-645, 657 <i>Physics Lab</i> 580-581 TWE: HSS 296 UA 286 |
| c. Know that heat is evidenced by random motion and the vibrations of atoms, molecules, and ions. | SE: 314-315, 317, 347-348, 360-361, 601-602 TWE: AML 330 |

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| d. Know that energy is transferred by various types of waves and by electrons flowing through matter. | SE: 381-384, 404-405, 592-593, 601-603, 618-620, 709-711, 777 <i>Physics Lab</i> 606-607, 632-633 |
| 655. TECHNOLOGY. | |
| 01. Understand the relationship between science and technology and develop the abilities of technological design and application. | |
| a. Know the ways that science advances technology and technology advances science. | SE: <i>Extreme Physics</i> 792 <i>Technology and Society</i> 220, 304, 450, 608 TWE: CB 158 PP 232 RLC 289, 319 RLP 238 |
| b. Recognize that science and technology are pursued for different purposes and that scientific inquiry is driven by the desire to understand the natural world and technological design is driven by the need to meet human needs and solve human problems. | SE: 8-10 <i>Extreme Physics</i> 506, 662 <i>Future Technology</i> 22, 826 <i>Technology and Society</i> 220, 394, 608, 716 TWE: RLC 180 |
| c. Know that critical thinking, creativity, imagination, and a good knowledge base are all required in the work of science and engineering. | SE: 3-4 <i>Extreme Physics</i> 50, 662, 792 <i>Future Technology</i> 248, 476, 768 <i>Technology and Society</i> 304, 450 TWE: RLP 295 |
| d. Know the elements of technological design, which include the following: - Identify a problem or design an opportunity; - Propose designs and choose between alternative solutions; - Implement a proposed solution; - Evaluate the solution and its consequences; - Communicate the problem, process, and solution. | SE: <i>How It Works</i> 334, 688, 740 <i>Physics Lab</i> 160-161, 660-661 <i>Technology and Society</i> 138, 220, 304, 394 TWE: RLP 295 |
| e. Use available technology to assist in solving problems. | SE: 19, 659 <i>Extreme Physics</i> 792 <i>Future Technology</i> 22 <i>Technology and Society</i> 220 |
| 656. PERSONAL AND SOCIAL PERSPECTIVES. | |
| 01. Understand common environmental quality issues, both natural and human induced. | |
| a. Identify issues, including but not limited to: - Water quality; - Air quality; - Hazardous waste; - Forest health. | SE: <i>Future Technology</i> 826 <i>Technology and Society</i> 394, 716 TWE: CD 327 EX 814 RLC 289 |
| 02. Understand the causes and effects of population change. | |
| a. Understand the impact of technological development and the growth of human population on the living and nonliving environment. | SE: 331 <i>Future Technology</i> 826 <i>Technology and Society</i> 394, 716 TWE: CD 327 EX 814 RLC 289 |

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| b. Understand the impact of population change on natural resources and community infrastructure. | SE: 331 <i>Technology and Society</i> 716 |
| 03. Understand the importance of natural resources and the need to manage and conserve them. | |
| a. Understand the differences between renewable and nonrenewable resources. | SE: <i>Technology and Society</i> 608 TWE: EX 605 PP 330 |
| b. Understand the differences between preservation and conservation. | SE: 603-604 TWE: CB 684 RLP 630 |
| c. Understand the role and effect of management of natural resources. | SE: <i>Technology and Society</i> 608 TWE: CB 684 EX 605 RLP 630 |
| 04. Understand different uses of technology in science and how they affect our standard of living. | |
| a. Identify examples of technologies used in scientific fields, including but not limited to: - Weather forecasting; - Food production; - Environmental cleanup; - Advances in medicine; - Communications; - The space program. | SE: 502-503, 659 <i>Extreme Physics</i> 662 <i>Future Technology</i> 22, 162, 476, 556, 768, 826 TWE: AP 289 |
| 657. HISTORY OF SCIENCE. | |
| 01. Understand the significance of major scientific milestones. | |
| a. Understand the social and economic impact of historical scientific events. | SE: 179-180, 643, 705-712, 723-729, 775 TWE: CB 344, 354 CD 407 RLP 295, 383 |
| b. Understand the contributions of notable scientists. | SE: 172-176, 184-185, 549-550, 573, 648-649, 698-700, 705-708, 724-731, 806 TWE: CB 9 |
| 658. INTERDISCIPLINARY CONCEPTS. | |
| 01. Understand that interpersonal relationships are important in scientific endeavors. | |
| a. Know the importance of working in interdisciplinary teams to solve scientific problems. | SE: 11-12, 811 <i>Physics Lab</i> 274-275, 766-767 <i>Technology and Society</i> 138, 304, 450 TWE: CB 749 |
| 02. Understand technical communication. | |
| a. Read for information. | SE: 179-185, 323-331, 439-442, 524-531, 601-605, 747-761, 815-823 <i>Technology and Society</i> 304, 450, 716 |
| b. Write and articulate technical information. | SE: 15-17, 38-47 <i>Physics Lab</i> 108-109, 136-137, 186-187, 274-275, 302-303, 504-505, 686-687 |

Codes Used for TWE Pages

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| AML | Additional MiniLab |
| AP | Applying Physics |
| CB | Content Background |
| CD | Concept Development |
| CT | Critical Thinking |
| CU | Check for Understanding |
| DI | Discussion |
| EX | Extension |
| HSS | Helping Struggling Students |
| IM | Identifying Misconceptions |
| PP | Physics Project |
| RLC | Real-Life Careers |
| RLP | Real-Life Physics |
| RT | Reteach |
| TPK | Tie to Prior Knowledge |
| UA | Using an Analogy |
| UF | Using Figure |