

GLENCOE CORRELATION
PHYSICS: PRINCIPLES AND PROBLEMS
NEW JERSEY
 Core Curriculum Content Standards for Science
 Grade 12

STANDARDS	PAGE REFERENCES
STANDARD 5.1 (SCIENTIFIC PROCESSES) ALL STUDENTS WILL DEVELOP PROBLEM-SOLVING, DECISION-MAKING AND INQUIRY SKILLS, REFLECTED BY FORMULATING USABLE QUESTIONS AND HYPOTHESES, PLANNING EXPERIMENTS, CONDUCTING SYSTEMATIC OBSERVATIONS, INTERPRETING AND ANALYZING DATA, DRAWING CONCLUSIONS, AND COMMUNICATING RESULTS.	
Building upon knowledge and skills gained in the preceding grades, by the end of Grade 12, students:	
A. Habits of Mind	
1. When making decisions, evaluate conclusions, weigh evidence, and recognize that arguments may not have equal merit.	SE: 729-731 <i>History Connection</i> 583 <i>Physics & Society</i> 8, 70, 334 <i>Physics Lab</i> 12, 308, 727 <i>Problem Solving Strategies</i> 17, 57
2. Assess the risks and benefits associated with alternative solutions.	SE: 6-11, 637-640, 658-659, 725-731 <i>History Connection</i> 583 <i>Physics & Society</i> 70, 266, 356 <i>Physics Lab</i> 12, 727
3. Engage in collaboration, peer review, and accurate reporting of findings.	SE: 5-11, 24-29 <i>Physics Lab</i> 12, 32, 162, 232, 330, 446, 727
4. Explore cases that demonstrate the interdisciplinary nature of the scientific enterprise.	SE: <i>Biology Connection</i> 238-239, 620, 723 <i>Chemistry Connection</i> 312 <i>Earth Science Connection</i> 130, 335, 566 <i>Physics & Technology</i> 167, 202, 732
B. Inquiry and Problem Solving	
1. Select and use appropriate instrumentation to design and conduct investigations.	SE: <i>Physics & Technology</i> 292, 428, 519, 663 <i>Physics Lab</i> 213, 362, 446, 545, 562, 595
2. Show that experimental results can lead to new questions and further investigations.	SE: <i>Physics Lab</i> 12, 58, 100, 162, 281, 330, 362, 446, 496, 612
C. Safety	
1. Understand, evaluate and practice safe procedures for conducting science investigations.	SE: 877 <i>How It Works</i> 709 <i>Physics & Society</i> 334, 587 <i>Physics Lab</i> 281, 446, 518, 545, 562, 684
STANDARD 5.2 (SCIENCE AND SOCIETY) ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF HOW PEOPLE OF VARIOUS CULTURES HAVE CONTRIBUTED TO THE ADVANCEMENT OF SCIENCE AND TECHNOLOGY, AND HOW MAJOR DISCOVERIES AND EVENTS HAVE ADVANCED SCIENCE AND TECHNOLOGY.	
Building upon knowledge and skills gained in the preceding grades, by the end of Grade 12, students:	
A. Cultural Contributions	
1. Recognize the role of the scientific community in responding to changing social and political conditions and how scientific and technological achievement effect historical events.	SE: <i>Earth Science Connection</i> 263 <i>History Connection</i> 583 <i>Physics & Society</i> 70, 266, 334, 356, 587

STANDARDS	PAGE REFERENCES
B. Historical Perspectives	
1. Examine the lives and contributions of important scientists who effected major breakthroughs in our understanding of the natural and designed world.	SE: 4-6, 176-177, 181-184, 191-192, 305-307, 470-472, 560-563, 626-630, 637-640, 646-659
2. Discuss significant technological achievements in which science has played an important part as well as technological advances that have contributed directly to the advancement of scientific knowledge.	SE: 437-438, 726-730 <i>F.Y.I.</i> 54, 375 <i>How It Works</i> 405, 453 <i>Physics & Society</i> 266 <i>Physics & Technology</i> 178, 378, 428
3. Describe the historical origin of important scientific developments such as atomic theory, genetics, plate tectonics, etc., showing how scientific theories develop, are tested, and can be replaced or modified in light of new information and improved investigative techniques.	SE: 122-127, 176-182, 191-192, 274-277, 304-307, 374-376, 582-588, 613-620, 646-659, 673-686
STANDARD 5.3 (MATHEMATICAL APPLICATIONS) ALL STUDENTS WILL INTEGRATE MATHEMATICS AS A TOOL FOR PROBLEM-SOLVING IN SCIENCE, AND AS A MEANS OF EXPRESSING AND/OR MODELING SCIENTIFIC THEORIES.	
Building upon knowledge and skills gained in the preceding grades, by the end of Grade 12, students:	
A. Numerical Operations	
1. Reinforce indicators from previous grade level.	SE: 16-19, 24-27, 48-51, 64-68, 72-76, 737-747 <i>Physics Lab</i> 32, 58, 69, 362
B. Geometry and Measurement	
1. When performing mathematical operations with measured quantities, express answers to reflect the degree of precision and accuracy of the input data.	SE: 24-29, 64-68, 128-129, 150-153, 737-739 <i>F.Y.I.</i> 101 <i>Physics Lab</i> 100, 137, 162 <i>Problem Solving Strategies</i> 17-18
C. Patterns and Algebra	
1. Apply mathematical models that describe physical phenomena to predict real world events.	SE: 81-88, 185-192, 212, 233-239, 358-361, 435-438, 811-815, 833-838, 841-848 <i>Physics Lab</i> 281
D. Data Analysis and Probability	
1. Construct and interpret graphs of data to represent inverse and non-linear relationships, and statistical distributions.	SE: 30-34, 72-75, 82-87, 90-92, 94-99, 698-699, 811-816, 841-849 <i>Physics Lab</i> 179, 700
STANDARD 5.4 (NATURE AND PROCESS OF TECHNOLOGY) ALL STUDENTS WILL UNDERSTAND THE INTERRELATIONSHIPS BETWEEN SCIENCE AND TECHNOLOGY AND DEVELOP A CONCEPTUAL UNDERSTANDING OF THE NATURE AND PROCESS OF TECHNOLOGY.	
Building upon knowledge and skills gained in the preceding grades, by the end of Grade 12, students:	
A. Science and Technology	
1. Know that scientific inquiry is driven by the desire to understand the natural world and seeks to answer questions that may or may not directly influence humans, while technology is driven by the need to meet human needs and solve human problems.	SE: 4-11, 176-177, 181-184, 191-192, 258-264, 626-632 <i>Physics & Society</i> 266, 356, 587 <i>Physics & Technology</i> 178, 378

STANDARDS	PAGE REFERENCES
B. Nature of Technology	
1. Assess the impacts of introducing a new technology in terms of alternative solutions, costs, tradeoffs, risks, benefits and environmental impact.	SE: 722-729 <i>History Connection</i> 583 <i>Physics & Society</i> 70, 266, 356, 486, 587, 683 <i>Physics & Technology</i> 378, 732
C. Technological Design	
1. Plan, develop, and implement a proposal to solve an authentic, technological problem.	SE: <i>Physics Lab</i> 32, 58, 100, 545, 562, 595 <i>Problem Solving Strategies</i> 57, 156, 228, 544
STANDARD 5.6 (CHEMISTRY) ALL STUDENTS WILL GAIN AN UNDERSTANDING OF THE STRUCTURE AND BEHAVIOR OF MATTER.	
Building upon knowledge and skills gained in the preceding grades, by the end of Grade 12, students:	
A. Structure and Properties of Matter	
1. Know that atoms are made of a positive nucleus surrounded by negative electrons and that the nucleus, a tiny fraction of the volume of an atom, is composed of protons and neutrons, each almost 2,000 times more massive than an electron.	SE: 646-653, 658-659, 692-693, 701-702, 718-721, 725-731 <i>Physics Lab</i> 656
2. Know that the number of protons in the nucleus defines the element.	SE: 693, 876 TWE: UM 694
3. Know that an atom's electron arrangement, particularly the outermost electrons, determines how the atom can interact with other atoms.	SE: 673-676 TWE: CC 469 UM 672
4. Explain that atoms form bonds (ionic and covalent) with other atoms by transferring or sharing electrons.	SE: 658 TWE: CC 262, 283, 469
5. Explain how the Periodic Table of Elements reflects the relationship between the properties of elements and their atomic structure.	SE: 673-676 TWE: A 678 CU 677
6. Know that many biological, chemical and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules.	SE: <i>Physics & Technology</i> 663 TWE: AP 649 CBI 490 CC 511, 627 DE 286-287
7. Recognize that the properties of matter are related to the structure and arrangement of their molecules and atoms, such as in metallic and nonmetallic crystals and carbon compounds.	SE: 564, 658, 673-676 <i>Chemistry Connection</i> 312 <i>Pocket Lab</i> 284 TWE: AP 649 CBI 490 CC 627, 685, 698
8. Know that different levels of energy of an atom are associated with different configurations of its electrons.	SE: 650-654, 670-676 <i>Physics & Technology</i> 663

STANDARDS	PAGE REFERENCES
B. Chemical Reactions	
1. Explain that the rate of reactions among atoms and molecules depends on how often they encounter one another and that the rate is affected by nature of reactants, concentration, pressure, temperature, and the presence of a catalyst.	<p>Note: The basis for the study of chemical reaction rates lies in the physics of the kinetic-molecular theory.</p> <p>SE: 274-275 TWE: CC 469</p>
2. Show that some changes in chemical bonds require a net input or net release of energy.	<p>SE: <i>Chemistry Connection</i> 289 TWE: AP 282 CC 262, 283, 511</p>
STANDARD 5.7 (PHYSICS) ALL STUDENTS WILL GAIN AN UNDERSTANDING OF NATURAL LAWS AS THEY APPLY TO MOTION, FORCES, AND ENERGY TRANSFORMATIONS.	
Building upon knowledge and skills gained in the preceding grades, by the end of Grade 12, students:	
A. Motion and Forces	
1. Apply the mathematical relationship between the mass of an object, the net force exerted on it, and the resulting acceleration.	<p>SE: 119-121, 126-130, 150-151, 155-161, 163-168, 185-187, 200-203 <i>Physics Lab</i> 162 TWE: UM 124</p>
2. Explain that whenever one object exerts a force on another, an equal and opposite force is exerted on the first object.	<p>SE: 138-139, 143, 207-212, 214-215 <i>Physics & Technology</i> 167 <i>Physics Lab</i> 213 <i>Problem Solving Strategies</i> 140</p>
3. Recognize gravity as a universal force of attraction between masses and that the force is proportional to the masses and inversely proportional to the square of the distance between them.	<p>SE: 104-106, 118-119, 175, 181-183, 185-186, 189-192, 252-254 <i>Physics Lab</i> 179 <i>Pocket Lab</i> 188 TWE: CB 187</p>
4. Recognize that electrically charged bodies can attract or repel each other with a force that depends upon the size and nature of the charges and the distance between them and know that electric forces play an important role in explaining the structure and properties of matter.	<p>SE: 462-464, 468-475, 482, 488-489, 493-494 <i>Physics Lab</i> 467 TWE: A 466, 476 AP 465 CBI 490</p>
5. Know that there are strong forces that hold the nucleus of an atom together and that significant amounts of energy can be released in nuclear reactions (fission, fusion, and nuclear decay) when these binding forces are disrupted.	<p>SE: 141, 693-694, 718-721, 725-731 TWE: CR 138 CUL 723</p>
6. Explain how electromagnetic, gravitational, and nuclear forces can be used to produce energy by causing chemical, physical, or nuclear changes and relate the amount of energy produced to the nature and relative strength of the force.	<p>SE: 252-256, 586-589, 718-721, 725-731 <i>Earth Science Connection</i> 263 <i>Physics & Society</i> 266 <i>Physics Lab</i> 595 TWE: CC 262, 511 DE 516-517</p>

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7. Demonstrate that moving electric charges can produce magnetic forces and moving magnets can produce electric forces.	SE: 567-568, 570-573, 582-584, 586, 588-594 <i>Physics & Society</i> 587 <i>Physics Lab</i> 595 <i>Pocket Lab</i> 585 TWE: CCR 596
8. Recognize that magnetic and electrical forces are different aspects of a single electromagnetic force.	SE: 583-584, 590-593, 613-620 <i>Physics & Society</i> 587 <i>Physics Lab</i> 595 <i>Pocket Lab</i> 585, 588
B. Energy Transformations	
1. Explain how the various forms of energy (heat, electricity, sound, light) move through materials and identify the factors that affect that movement.	SE: 278-280, 282-283, 291-294, 350-351, 394-401, 512-514, 520-523 <i>Physics Lab</i> 281, 362 TWE: UM 376
2. Explain that while energy can be transformed from one form to another, the total energy of a closed system is constant.	SE: 258-261, 289-290, 590-591, 628-630 <i>Physics & Society</i> 266 TWE: RE 636 CU 264
3. Recognize that whenever mechanical energy is transformed, some heat is dissipated and is therefore unavailable for use.	Note: In addition to mechanical energy heat loss, the transfer of electrical energy generates heat that may be lost to the environment. SE: 130-131, 234, 289-294, 512-513, 520-523 TWE: CU 264 UM 594
4. Explain the nature of electromagnetic radiation and compare the components of the electromagnetic spectrum from radio waves to gamma rays.	SE: 374, 613-617, 619-620, 626, 855-859

Codes Used for TWE Pages

A	Activity
AP	Applying Physics
CB	Content Background
CBI	Connections to Biology
CC	Chemistry Connection
CCR	Connections to Criminology
CR	Content Refresher
CU	Checking for Understanding
CUL	Cultural Diversity
DE	Demonstration
RE	Reteach
UM	Uncovering Misconceptions