

Correlation to New Jersey Core Curriculum Content Standards for Science
Foundations of Physics
Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|----------------------|----------------|---|--------------------|--|---------------------|--|
| 12.5.1.A1 by end of grade 12 | Scientific Processes | Habits of Mind | When making decisions, evaluate conclusions, weigh evidence, and recognize that arguments may not have equal merit. | 8 | Comparing a theory and a natural law | 111 | how does what you observed support the quantum theory? |
| | | | | 8 | testing hypotheses with experiments | | |
| | | | | 62 | acceleration of cars | | |
| | | | | 136 | determining formula for acceleration on a ramp | | |
| | | | | 188 | perpetual motion machines | | |
| | | | | 292 | sound in space | | |
| | | | | 367 | speed of light did not behave as expected for Michelson and Morley | | |
| | | | | 369 | proof of time dilation | | |
| | | | | 372 | holograms and science fiction special effects | | |
| | | | | 375 | explain Thomas Young's demonstration of the wave nature of light | | |
| | | | | 576 | transporter beams | | |

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| 12.5.1.A2 by end of grade 12 | Scientific Processes | Habits of Mind | Assess the risks and benefits associated with alternative solutions. | 219 | using energy efficient products | | |
| | | | | 392 | hybrid cars combine advantages of gasoline fuel and electric power | | |
| | | | | 534 | energy-efficient building application | | |
| | | | | 604 | balancing chemical equation of acid rain | | |
| | | | | 607 | impact of combustion reaction of gasoline | | |
| 12.5.1.A3 by end of grade 12 | Scientific Processes | Habits of Mind | Engage in collaboration, peer review, and accurate reporting of findings. | 42 | writing procedures in a lab notebook helps make sure your results are repeatable | 122 | communicate your findings |
| | | | | | | 122 | present your findings |
| | | | | | | 175 | display information you found for your element |
| | | | | | | 202 | keep detailed notes as you work |

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| 12.5.1.A4 by end of grade 12 | Scientific Processes | Habits of Mind | Explore cases that demonstrate the interdisciplinary nature of the scientific enterprise. | 13 | medical and health professions use physics | | |
| | | | | 16 | the relation between physics and other fields of science | | |
| | | | | 91 | biomechanics application | | |
| | | | | 449 | Earth's magnetism | | |
| | | | | 498 | search for answers in physics and chemistry | | |
| | | | | 592 | connections between biology and chemistry and physics | | |

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| 12.5.1.B1 by end of grade 12 | Scientific Processes | Inquiry and Problem Solving | Select and use appropriate instrumentation to design and conduct investigations. | 18 25 | measuring distance accuracy and precision of measurements | 1 6 21 28 43 60 67 67 82 85 85 129 201 202 | estimating length accuracy and resolution and printing conduct the experiment set up the ultimate pulley measure and record the distance measure input and output forces set up the straight track measure vertical distance measure the length of the string select appropriate technology to make measurements design and test a way to increase natural frequency choose circuit parts to light a bulb determine the equipment you will need conduct your experiment |

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| 12.5.1.B2 by end of grade 12 | Scientific Processes | Inquiry and Problem Solving | Show that experimental results can lead to new questions and further investigations. | 7 | revising explanations through observation | 13 | predict speed of ball |
| | | | | 7 | creating theories based on observations | 18 | how would acceleration be different? |
| | | | | 8 | refining theories based on observations | 18 | propose one way to increase acceleration |
| | | | | 498 | since wood is created from other matter it must not be a fundamental substance | 33 | calculate the predicted speed |
| | | | | | | 37 | use your graph to make a prediction |
| | | | | | | 38 | use your graph to make a prediction |
| | | | | | | 42 | predict exact landing location |
| | | | | | | 65 | predict where the ball moves fastest |
| | | | | | | 132 | predict what the current will be |
| | | | | | | 202 | would you modify your procedure further? |

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| 12.5.1.C1 by end of grade 12 | Scientific Processes | Safety | Understand, evaluate and practice safe procedures for conducting science investigations. | 543 | featured throughout CPO Science program safety factors | 79 129 131 150 159 160 176 176 185 192 206 | safety note safety precautions safety precautions safety note safety note electromagnet safety safety note heat safety safety tip gas pressure safety note acid safety |

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|------------------------------------|------------------------|---------------------------|---|----------------------------|--|-----------------------------|---------------|
| 12.5.2.A1 by end of grade 12 | Science and Society | Cultural Contributions | Recognize the role of the scientific community in responding to changing social and political conditions and how scientific and technological achievement affect historical events. | 12 | engineers design practical devices for solving problems | | |
| | | | | 14 | using analysis and problem solving and an understanding of technology to make economic decisions | | |
| | | | | 31 | use of nanotechnology | | |
| | | | | 52 | Dr. Harold Edgerton and strobe photography | | |
| | | | | 52 | Dr. Harold Edgerton and strobe photography | | |
| | | | | 72 | antilock brakes application | | |
| | | | | 91 | biomechanics application | | |
| | | | | 92 | applications of biomechanics | | |
| | | | | 112 | designing a bridge | | |
| | | | | 138 | use of robots | | |
| | | | | 155 | geostationary satellites | | |
| | | | | 155 | first artificial human- made Earth satellite was Sputnik | | |
| | | | | 178 | Great Pyramid of Giza and simple machines | | |
| | | | | 196 | hydroelectric power application | | |
| | | | | 209 | range of power for common devices | | |

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|----------------------------|----------|--------|------------------------|--------------------|---|---------------------|--------|
| | | | | 216 | energy from ocean tides | | |
| | | | | 217 | research into tidal power | | |
| | | | | 228 | seat belts and air bags | | |
| | | | | 235 | jet engines application | | |
| | | | | 257 | Pierre and Jacques Curie and the piezoelectric effect | | |
| | | | | 257 | quartz crystals application | | |
| | | | | 269 | wave motion and equilibrium | | |
| | | | | 280 | microwave ovens application | | |
| | | | | 290 | technological breakthrough of sound recording | | |
| | | | | 293 | uses of Doppler radar | | |
| | | | | 310 | past theories of light | | |
| | | | | 311 | invention of electric light | | |
| | | | | 325 | history of printing | | |
| | | | | 325 | the printing press | | |
| | | | | 348 | the usefulness of recorded images | | |
| | | | | 349 | the telescope | | |
| | | | | 349 | the telescope | | |
| | | | | 361 | Young's double-slit experiment | | |

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|----------------------------|----------|--------|------------------------|--------------------|---|---------------------|--------|
| | | | | 368 | Einstein's thinking revolutionized physics | | |
| | | | | 378 | importance of electricity | | |
| | | | | 392 | hybrid gas/electric cars application | | |
| | | | | 413 | wiring application | | |
| | | | | 434 | how television works application | | |
| | | | | 447 | discovering and using magnetism | | |
| | | | | 451 | MRI application | | |
| | | | | 490 | why computers are useful | | |
| | | | | 501 | search for elements and alchemy | | |
| | | | | 534 | energy-efficient building application | | |
| | | | | 535 | designing buildings to be energy efficient | | |
| | | | | 561 | the Alvin research submarine | | |
| | | | | 575 | discovery of helium | | |
| | | | | 585 | economics of laser technology | | |
| | | | | 623 | creation of CAT scans | | |
| | | | | 625 | turning lead into gold | | |
| | | | | 631 | nuclear power application | | |

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|----------------------------|----------|--------|------------------------|--------------------|---------------------------------------|---------------------|--------|
| | | | | 641 | research on future of the universe | | |

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|------------------------------------|------------------------|----------------------------|---|----------------------------|---|-----------------------------|---|
| 12.5.2.B1 by end of grade 12 | Science and Society | Historical Perspectives | Examine the lives and contributions of important scientists who effected major breakthroughs in our understanding of the natural and designed world. | 41 | Galileo and Newton conducted experiments with balls on ramps | 147 | Gilbert built the first electroscope |
| | | | | 52 | Dr. Harold Edgerton and strobe photography | | |
| | | | | 78 | Newton's laws of motion | | |
| | | | | 81 | Newton's discovery of the connection between force and mass and acceleration | | |
| | | | | 152 | Sir Isaac Newton and law of universal gravitation | | |
| | | | | 208 | James Watt | | |
| | | | | 257 | Pierre and Jacques Curie and the piezoelectric effect | | |
| | | | | 311 | Thomas Edison and the electric light | | |
| | | | | 314 | Einstein and the speed of light | | |
| | | | | 316 | Albert Einstein | | |
| | | | | 349 | Galileo and telescopes | | |
| | | | | 350 | Newtonian reflecting telescope | | |
| | | | | 361 | Thomas Young | | |
| | | | | 366 | Albert Einstein's theory of special relativity | | |
| | | | | 367 | Albert A. Michelson and Edward R. Morley | | |

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|----------------------------|----------|--------|------------------------|--------------------|---|---------------------|--------|
| | | | | 382 | Ben Franklin and current | | |
| | | | | 400 | Gustav Robert Kirchhoff | | |
| | | | | 420 | Charles-Augustin de Coulomb | | |
| | | | | 456 | Hans Christian Oersted | | |
| | | | | 472 | Dr. D. Bruce Montgomery | | |
| | | | | 499 | Democritus | | |
| | | | | 499 | Albert Einstein | | |
| | | | | 574 | Niels Bohr | | |
| | | | | 575 | Johann Balmer | | |
| | | | | 578 | Wolfgang Pauli | | |
| | | | | 580 | Max Planck and Albert Einstein | | |
| | | | | 580 | Newton and classical physics | | |
| | | | | 614 | Marie Curie | | |
| | | | | 615 | Henri Bequerel and beta rays | | |
| | | | | 630 | Wolfgang Pauli | | |
| | | | | 644 | proof of Einstein's theory of general relativity | | |
| | | | | 647 | Paul Dirac | | |

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|------------------------------------|------------------------|----------------------------|--|----------------------------|---|-----------------------------|---------------|
| 12.5.2.B2 by end of grade 12 | Science and Society | Historical Perspectives | 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. | 12 | all technology is based on fundamental laws of physics | | |
| | | | | 31 | use of nanotechnology | | |
| | | | | 51 | analyzing motion with video and strobe photography | | |
| | | | | 72 | antilock brakes application | | |
| | | | | 112 | relationship between science and engineering and technology | | |
| | | | | 172 | bicycle physics application | | |
| | | | | 196 | hydroelectric power application | | |
| | | | | 235 | jet engines application | | |
| | | | | 243 | oscillators are used in communications and music and clocks | | |
| | | | | 257 | quartz crystals application | | |
| | | | | 263 | waves can carry information | | |
| | | | | 280 | microwave ovens application | | |
| | | | | 325 | the printing press | | |
| | | | | 369 | technological advances have allowed discovery of the expanding universe | | |
| | | | | 372 | holography application | | |

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|----------------------------|----------|--------|------------------------|--------------------|--|---------------------|--------|
| | | | | 392 | hybrid gas/electric cars application | | |
| | | | | 413 | wiring application | | |
| | | | | 429 | electron beam accelerators | | |
| | | | | 434 | how television works application | | |
| | | | | 451 | MRI application | | |
| | | | | 472 | maglev train application | | |
| | | | | 473 | how magplanes levitate | | |
| | | | | 492 | computers and electronic addition of numbers application | | |
| | | | | 516 | refrigerator application | | |
| | | | | 534 | energy-efficient building application | | |
| | | | | 560 | deep water submarine Alvin application | | |
| | | | | 585 | laser application | | |
| | | | | 615 | smoke detectors | | |
| | | | | 623 | creation of CAT scans | | |
| | | | | 631 | nuclear power application | | |

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|------------------------------------|------------------------|----------------------------|---|--------------------|--|---------------------|---|
| 12.5.2.B3 by end of grade 12 | Science and Society | Historical Perspectives | Describe the historical origin of important scientific developments such as atomic theory, plate tectonics, ect., showing how scientific theories develop, are tested, and can be replaced or modified in light of new information and improved techniques. | 41 | Galileo and Newton conducted experiments with balls on ramps | 75 | the discovery of atom's nucleus |
| | | | | 78 | Newton's laws of motion | 122 | research types of electromagnetic waves |
| | | | | 81 | Newton's discovery of the connection between force and mass and acceleration | | |
| | | | | 152 | Sir Isaac Newton and law of universal gravitation | | |
| | | | | 349 | Galileo and telescopes | | |
| | | | | 350 | Newtonian reflecting telescope | | |
| | | | | 382 | Ben Franklin and current | | |
| | | | | 420 | Charles-Augustin de Coulomb | | |
| | | | | 440 | magnetism | | |
| | | | | 447 | history of magnetism | | |
| | | | | 499 | development of atomic theory | | |
| | | | | 501 | ancient Greeks' ideas of elements | | |
| | | | | 580 | Newton and classical physics | | |
| | | | | 614 | Marie Curie | | |
| | | | | 615 | Henri Bequerel and beta rays | | |

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|------------------------------------|------------------------------|-----------------------------|---|--------------------|---|--------------------------------|---|
| 12.5.3.B1 by end of grade 12 | Mathematical Applications | Geometry and Measurement | When performing mathematical operations with measured quantities, express answers to reflect the degree of precision and accuracy of the print data. | 21 25 | calculating volume of simple shapes accuracy and precision of measurements | 2 6 15 18 | significant digit practice collecting data with precision collect time data with precision collect time data with precision |

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|------------------------------------|------------------------------|-------------------------|--|--------------------|---|---------------------|---|
| 12.5.3.C1 by end of grade 12 | Mathematical Applications | Patterns and Algebra | Apply mathematical models that describe physical phenomena to predict real world events. | 7 | creating theories based on observations | 13 | compare prediction to measurement |
| | | | | 11 | Ptolemy model vs. Copernicus model of the solar system | 13 | create a graph |
| | | | | 13 | predict speed of ball | 13 | predict speed of ball |
| | | | | 40 | making a good model | 16 | create a graph |
| | | | | 43 | constructing a graph | 16 | describe the graph |
| | | | | 44 | graphical models | 18 | how would acceleration be different? |
| | | | | 44 | using a graphical model to make a prediction and checking the model's accuracy | 22 | how do you measured positions compare to model? |
| | | | | 54 | constructing a graph | 22 | create graphs |
| | | | | 55 | create a graph from a data table | 22 | compare calculation with graph estimate |
| | | | | 60 | creating the acceleration formula from experiments | 22 | uniform acceleration model |
| | | | | 66 | developing the formulas for a model of motion with constant acceleration | 24 | create an algebraic model |
| | | | | 282 | write a formula relating velocity of wave to period and wavelength | 28 | solve second law equation for string tension |
| | | | | 290 | the process of digital sound reproduction | 29 | does experiment agree with prediction? |
| | | | | 297 | frequency spectrum | 32 | develop a model that predicts acceleration |
| | | | | 312 | light intensity follows an inverse square law | 33 | calculate the predicted speed |
| | | | | | | 37 | use your graph to make a prediction |
| | | 37 | make a graph | | | | |

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|----------------------------|----------|--------|------------------------|--------------------|--|---------------------|--|
| | | | | 411 | the waveform of AC electricity | 38 | make a graph |
| | | | | 498 | since wood is created from other matter it must not be a fundamental substance | 38 | use your graph to make a prediction |
| | | | | | | 42 | predict exact landing location |
| | | | | | | 43 | create algebraic model |
| | | | | | | 43 | how does the measurement compare to your prediction? |
| | | | | | | 43 | sketch four graphs |
| | | | | | | 49 | write a formula |
| | | | | | | 56 | create a graph |
| | | | | | | 65 | predict where the ball moves fastest |
| | | | | | | 66 | create a graph of speed vs. position |
| | | | | | | 76 | compare predicted mass to actual mass |
| | | | | | | 82 | make three different graphs |
| | | | | | | 87 | sketch a graph |
| | | | | | | 94 | give an equation that describes your observations |
| | | | | | | 114 | are there differences between your prediction and measurement? |
| | | | | | | 132 | predict what the current will be |

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|----------------------------|----------|--------|------------------------|--------------------|--------|---|--------|
| | | | | | | 135 graph voltage vs. current 136 graph voltage vs. current 151 make a graph of voltage vs. time 160 create a graph 167 make a graph of voltage vs. number of magnets 169 make a current vs. voltage graph for the diode 189 Bernoulli's equation | |

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|------------------------------------|---------------------------|-------------------------------|--|--------------------|---|---------------------|--|
| 12.5.3.D1 by end of grade 12 | Mathematical Applications | Data Analysis and Probability | Construct and interpret graphs of data to represent inverse and non-linear relationships, and statistical distributions. | 43 | draw a smooth curve; do NOT simply connect the dots | 13 | create a graph |
| | | | | 43 | constructing a graph | 16 | find the slope of the line |
| | | | | 44 | graphical models | 16 | create a graph |
| | | | | 48 | slope of a position vs. time graph | 16 | describe the graph |
| | | | | 48 | slope of a position vs. time graph | 19 | find the slope of the line |
| | | | | 54 | constructing a graph | 22 | create graphs |
| | | | | 54 | constructing a graph | 37 | make a graph |
| | | | | 55 | create a graph from a data table | 38 | make a graph |
| | | | | 63 | acceleration and slope of a speed vs. time graph | 43 | sketch four graphs |
| | | | | 63 | acceleration and slope of a speed vs. time graph | 56 | create a graph |
| | | | | 260 | analyze graph of an oscillator | 66 | create a graph of speed vs. position |
| | | | | 290 | the process of digital sound reproduction | 82 | make three different graphs |
| | | | | 411 | the waveform of AC electricity | 87 | sketch a graph |
| | | | | | | 135 | graph voltage vs. current |
| | | | | | | 136 | graph voltage vs. current |
| | | | | | | 151 | make a graph of voltage vs. time |
| | | | | | | 160 | create a graph |
| | | | | | | 167 | make a graph of voltage vs. number of magnets |
| | | | | | | 169 | make a current vs. voltage graph for the diode |

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|------------------------------------|-------------------------------------|---------------------------|---|----------------------------|---|-----------------------------|---------------|
| 12.5.4.A1 by end of grade 12 | Nature and Process of Technology | Science and Technology | 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. | 4 | learning about natural laws through inquiry and observation | | |
| | | | | 7 | in science inquiry is used to uncover truth | | |
| | | | | 12 | engineers design practical devices for solving problems | | |
| | | | | 12 | all technology is based on fundamental laws of physics | | |
| | | | | 31 | use of nanotechnology | | |
| | | | | 31 | use of nanotechnology | | |
| | | | | 51 | analyzing motion with video and strobe photography | | |
| | | | | 72 | antilock brakes application | | |
| | | | | 72 | antilock brakes application | | |
| | | | | 112 | relationship between science and engineering and technology | | |
| | | | | 112 | designing a bridge | | |
| | | | | 138 | use of robots | | |
| | | | | 154 | the orbits of planets and comets | | |
| | | | | 155 | geostationary satellites | | |
| | | | | 172 | bicycle physics application | | |

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|----------------------------|----------|--------|------------------------|--------------------|---|---------------------|--------|
| | | | | 196 | hydroelectric power application | | |
| | | | | 196 | hydroelectric power application | | |
| | | | | 209 | range of power for common devices | | |
| | | | | 211 | output power from plants is input power for animals | | |
| | | | | 216 | energy from ocean tides | | |
| | | | | 217 | research into tidal power | | |
| | | | | 228 | seat belts and air bags | | |
| | | | | 235 | jet engines application | | |
| | | | | 235 | jet engines application | | |
| | | | | 243 | oscillators are used in communications and music and clocks | | |
| | | | | 243 | examples of oscillators | | |
| | | | | 257 | quartz crystals application | | |
| | | | | 257 | quartz crystals application | | |
| | | | | 259 | wing-beat cycle of a hummingbird | | |
| | | | | 263 | waves can carry information | | |
| | | | | 280 | microwave ovens application | | |
| | | | | 280 | microwave ovens application | | |

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|----------------------------|----------|--------|------------------------|--------------------|---|---------------------|--------|
| | | | | 293 | uses of Doppler radar | | |
| | | | | 311 | invention of electric light | | |
| | | | | 325 | the printing press | | |
| | | | | 325 | the printing press | | |
| | | | | 349 | the telescope | | |
| | | | | 369 | technological advances have allowed discovery of the expanding universe | | |
| | | | | 372 | holography application | | |
| | | | | 378 | importance of electricity | | |
| | | | | 392 | hybrid gas/electric cars application | | |
| | | | | 392 | hybrid gas/electric cars application | | |
| | | | | 413 | wiring application | | |
| | | | | 413 | wiring application | | |
| | | | | 429 | electron beam accelerators | | |
| | | | | 434 | how television works application | | |
| | | | | 434 | how television works application | | |
| | | | | 451 | MRI application | | |
| | | | | 451 | MRI application | | |
| | | | | 472 | maglev train application | | |
| | | | | 473 | how magplanes levitate | | |

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|----------------------------|----------|--------|------------------------|--------------------|--|---------------------|--------|
| | | | | 490 | why computers are useful | | |
| | | | | 492 | computers and electronic addition of numbers application | | |
| | | | | 516 | refrigerator application | | |
| | | | | 534 | energy-efficient building application | | |
| | | | | 534 | energy-efficient building application | | |
| | | | | 560 | deep water submarine Alvin application | | |
| | | | | 560 | deep water submarine Alvin application | | |
| | | | | 585 | laser application | | |
| | | | | 615 | smoke detectors | | |
| | | | | 623 | creation of CAT scans | | |
| | | | | 623 | creation of CAT scans | | |
| | | | | 631 | nuclear power application | | |
| | | | | 631 | nuclear power application | | |
| | | | | 644 | proof of Einstein's theory of general relativity | | |
| | | | | 645 | astronomers find black holes by what is around them | | |
| | | | | 646 | a standard model for particle physics | | |

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|------------------------------------|-------------------------------------|-------------------------|---|----------------------------|--|-----------------------------|---------------|
| 12.5.4.B1 by end of grade 12 | Nature and Process of Technology | Nature of Technology | Assess the impacts of introducing a new technology in terms of alternative solutions, costs, tradeoffs, risks, benefits and environmental impact. | 219 | using energy efficient products | | |
| | | | | 392 | hybrid cars combine advantages of gasoline fuel and electric power | | |
| | | | | 392 | environmental impact of auto pollution | | |
| | | | | 534 | energy-efficient building application | | |
| | | | | 604 | balancing chemical equation of acid rain | | |
| | | | | 607 | impact of combustion reaction of gasoline | | |
| | | | | 621 | human technology contributes to radiation in environment | | |
| | | | | 628 | nuclear waste | | |

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| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|-------------------------------------|-------------------------|---|--------------------|---|---------------------|---|
| 12.5.4.C1 by end of grade 12 | Nature and Process of Technology | Technological Design | Plan, develop, and implement a proposal to solve an authentic technological problem. | 113 | test and evaluate the prototype structure design | 83 | design and construct a pendulum |
| | | | | 113 | build and test a prototype structure out of toothpicks | 85 | create a system that oscillates |
| | | | | 113 | conceptual design for a bridge | 163 | design and test different electric motors |
| | | | | 113 | the engineering design cycle | 163 | propose solutions that will work for each disk |
| | | | | 389 | electrical devices are designed to operate at a certain voltage | 163 | apply steps of the design cycle to building different electric motors |
| | | | | 543 | evaluate three designs for a bridge | 164 | evaluate the performance of motor designs |
| | | | | 543 | failure analysis in the design process | 167 | suggest improvements you could make to the generator design |
| | | | | | | 173 | designing and building logic circuits |
| | | 191 | build an air-speed tester | | | | |

Correlation to New Jersey Core Curriculum Content Standards for Science

Foundations of Physics

Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|----------|--------------------|---|--------------------|--|---------------------|--|
| 12.5.7.A1 by end of grade 12 | Physics | Motions and Forces | Apply the mathematical relationship between the mass of an object, the net force exerted on it, and the resulting acceleration. | 81 | Newton's second law of motion | 28 | investigate Newton's second law |
| | | | | 83 | calculation using Newton's second law | 77 | relationship between force and motion and the second law |
| | | | | 84 | Newton's second law and dynamics problems | | |
| | | | | 85 | finding force from acceleration | | |
| | | | | 85 | force problems | | |
| | | | | 93 | problems using Newton's first law and second law | | |
| | | | | 106 | Newton's second law and net force | | |
| | | | | 108 | equilibrium and Newton's second law | | |
| | | | | 108 | use equilibrium to find an unknown force | | |
| | | | | 116 | calculate the acceleration of a toy | | |
| | | | | 136 | calculating acceleration on a ramp | | |
| | | | | 137 | calculating acceleration from 3-D forces | | |
| | | | | 137 | the vector form of Newton's second law | | |
| | | | | 149 | calculating centripetal force | | |
| | | | | 150 | formula for centripetal acceleration | | |

Correlation to New Jersey Core Curriculum Content Standards for Science

Foundations of Physics

Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|---|---------------------|--------|
| | | | | 169 | Newton's second law applies to rotational motion | | |
| | | | | 171 | Newton's second law for rotational motion variables | | |
| | | | | 228 | Newton's second law relating force and momentum | | |
| | | | | 229 | momentum form of Newton's second law | | |
| | | | | 252 | Newton's second law and natural frequency | | |

Correlation to New Jersey Core Curriculum Content Standards for Science
Foundations of Physics
Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|----------|-----------------------|---|--------------------|---|---------------------|--|
| 12.5.7.A2 by end of grade 12 | Physics | Motions and Forces | Explain that whenever one object exerts a force on another, an equal and opposite force is exerted on the first object. | 87 | forces always occur in action-reaction pairs | 30 | Newton's third law and free body diagrams |
| | | | | 88 | Newton's third law operates on pairs of objects | 30 | investigate Newton's third law |
| | | | | 89 | solving problems with action-reaction forces | 31 | draw free body diagrams and identify action-reaction pairs |
| | | | | 89 | identifying which force is acting on which object | | |
| | | | | 102 | the normal force as the reaction in an action-reaction pair | | |
| | | | | 107 | forces on a free-body diagram | | |
| | | | | 111 | understanding reaction forces in terms of springs and deformation | | |
| | | | | 112 | analysis of forces on a bridge | | |
| | | | | 135 | normal force of an inclined plane | | |
| | | | | 224 | momentum and Newton's third law | | |
| | | | | 425 | electric forces always occur in pairs according to Newton's third law | | |
| | | | | 548 | Newton's third law and pressure in a fluid | | |
| | | | | 550 | pressure and the third law | | |
| | | | | 557 | pressure of gases | | |

Correlation to New Jersey Core Curriculum Content Standards for Science

Foundations of Physics

Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|-----------------|---------------|--------------------------------|----------------------------|---------------|-----------------------------|---------------|
|------------------------------------|-----------------|---------------|--------------------------------|----------------------------|---------------|-----------------------------|---------------|

Correlation to New Jersey Core Curriculum Content Standards for Science

Foundations of Physics

Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail | |
|------------------------------------|----------|--------------------|---|--------------------|---|---------------------|-----------------------------------|---|
| 12.5.7.A3 by end of grade 12 | Physics | Motions and Forces | 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. | 68 | free fall and acceleration due to gravity | 23 | investigate the effect of gravity | |
| | | | | 69 | motion formulas for free fall | | 51 | calculate gravitational force of attraction |
| | | | | 70 | solving problems with free fall | | 51 | investigate law of universal gravitation |
| | | | | 71 | acceleration of gravity does not depend on mass | | | |
| | | | | 75 | problem understanding acceleration due to gravity | | | |
| | | | | 97 | strength of gravity on Earth and Jupiter | | | |
| | | | | 98 | gravity and acceleration and weightlessness | | | |
| | | | | 124 | projectiles and trajectories | | | |
| | | | | 128 | gravity only accelerates vertical motion | | | |
| | | | | 129 | vertical motion of a projectile | | | |
| | | | | 130 | projectiles launched at an angle | | | |
| | | | | 131 | range of projectiles | | | |
| | | | | 134 | resolving force of gravity in ramp coordinates | | | |
| | | | | 135 | acceleration down an inclined plane | | | |
| | | | | 141 | effects of gravity on motion of a projectile | | | |

Correlation to New Jersey Core Curriculum Content Standards for Science
Foundations of Physics
Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|---|---------------------|--------|
| | | | | 152 | description of law of universal gravitation | | |
| | | | | 152 | law of universal gravitation and orbital motion | | |
| | | | | 153 | formula and calculations for law of universal gravitation | | |
| | | | | 154 | orbits and gravitational force | | |
| | | | | 154 | orbital motion | | |
| | | | | 155 | centripetal force and the law of universal gravitation combine to form the orbit equation | | |
| | | | | 158 | compare projectile motion to orbital motion | | |
| | | | | 158 | calculate weight and acceleration due to gravity on Pluto | | |
| | | | | 165 | the motion of a tossed object | | |
| | | | | 166 | centers of mass and gravity may differ | | |
| | | | | 187 | work done against gravity | | |
| | | | | 191 | potential energy comes from gravity | | |
| | | | | 216 | tides are due to force of gravity | | |
| | | | | 642 | Newton's laws and gravity | | |

Correlation to New Jersey Core Curriculum Content Standards for Science

Foundations of Physics

Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|-----------------|---------------|--------------------------------|----------------------------|---------------|-----------------------------|---------------|
|------------------------------------|-----------------|---------------|--------------------------------|----------------------------|---------------|-----------------------------|---------------|

Correlation to New Jersey Core Curriculum Content Standards for Science

Foundations of Physics

Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|----------|-----------------------|--|--------------------|--|---------------------|---|
| 12.5.7.A4 by end of grade 12 | Physics | Motions and Forces | 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. | 418 | electric charge is a fundamental property of matter | 146 | build a simple electroscope |
| | | | | 419 | electric forces are created between electric charges | 147 | investigate the concept of electric charge |
| | | | | 420 | explanation of coulomb | 149 | investigate charged balloons |
| | | | | 421 | current is the flow of charge | 152 | investigate magnetic forces |
| | | | | 422 | negative charge of electrons and current flow | 154 | draw magnetic field lines for a bar magnet |
| | | | | 423 | static electricity and charge polarization and induction | 155 | test materials to see if they are affected by magnets |
| | | | | 424 | relationship of electric force and charge | 161 | experiment with pushes and pulls of permanent magnet in a rotor |
| | | | | 425 | the force between charges | | |
| | | | | 426 | charge creates an electric field | | |
| | | | | 428 | source charges and test charges | | |
| | | | | 430 | a capacitor stores charge | | |
| | | | | 433 | ability of a capacitor to store charge is capacitance | | |
| | | | | 440 | magnetism explained | | |
| | | | | 443 | understanding magnetic fields | | |

Correlation to New Jersey Core Curriculum Content Standards for Science
Foundations of Physics
Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|---|---------------------|--------|
| | | | | 445 | alignment of domains responds to magnetic fields | | |
| | | | | 446 | creating permanent magnets | | |
| | | | | 447 | the magnetic field of Earth | | |
| | | | | 448 | a compass is a magnet that lines up with Earth's magnetic field | | |
| | | | | 449 | the strength of Earth's magnetic field | | |
| | | | | 451 | magnetic field of a nucleus | | |
| | | | | 454 | magnetic field between two unlike poles | | |
| | | | | 458 | the magnetic field of loops and coils | | |
| | | | | 459 | the magnetic field of coils and permanent magnets | | |
| | | | | 460 | magnetic force on a moving charge | | |
| | | | | 461 | calculating magnetic fields and forces | | |

Correlation to New Jersey Core Curriculum Content Standards for Science
Foundations of Physics
Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|----------|-----------------------|--|--------------------|---|---------------------|--------------------|
| 12.5.7.A5 by end of grade 12 | Physics | Motions and Forces | Know that there are strong forces that hold the nucleus of an atom together and that significant amount of energy can be released in nuclear reactions(fission,fusion, and nuclear decay) when these binding forces are disrupted. | 502 | elements past #92 are radioactive and decay | 213 | fusion and fission |
| | | | | 568 | forces in the atom | | |
| | | | | 570 | radioactive isotopes | | |
| | | | | 570 | use of radioactive isotopes in medicine | | |
| | | | | 573 | fusion | | |
| | | | | 614 | radioactive decay | | |
| | | | | 616 | energy and radioactivity | | |
| | | | | 622 | x-ray machines | | |
| | | | | 623 | CAT scans | | |
| | | | | 626 | strong force and electromagnetic force in the nucleus | | |
| | | | | 627 | fusion reactions | | |
| | | | | 628 | fission reactions | | |
| | | | | 632 | nuclear energy | | |
| | | | | 635 | differences between fission and fusion | | |
| | | | | 649 | four forces in nature | | |

Correlation to New Jersey Core Curriculum Content Standards for Science
Foundations of Physics
Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|----------|--------------------|---|--------------------|---|---------------------|--------|
| 12.5.7.A6 by end of grade 12 | Physics | Motions and Forces | 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. | 189 | energy appears in different forms | | |
| | | | | 190 | different forms of energy | | |
| | | | | 212 | understand basic forms of energy | | |
| | | | | 310 | light is a form of energy | | |
| | | | | 322 | photons are bundles of light energy | | |
| | | | | 378 | electrical energy | | |
| | | | | 384 | batteries use chemical energy | | |
| | | | | 552 | explanation of pressure and energy | | |
| | | | | 597 | the energy of chemical bonds is described | | |
| | | | | 619 | radiation as a flow of energy | | |
| | | | | 622 | energy of x-rays | | |
| | | | | 625 | energy changes in nuclear reactions | | |
| | | | | 626 | source of energy in nuclear reactions | | |
| | | | | 627 | energy of fusion reactions | | |
| | | | | 628 | energy of fission reactions | | |
| | | | | 647 | energy from antimatter | | |

Correlation to New Jersey Core Curriculum Content Standards for Science
Foundations of Physics
Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|----------|------------------------|--|--------------------|---|---------------------|---|
| 12.5.7.B1 by end of grade 12 | Physics | Energy Transformations | Explain how the various forms of energy (heat, electricity, sound, light) move through materials and identify the factors that affect that movement. | 189 | energy appears in different forms | 72 | draw an energy flow diagram |
| | | | | 190 | conversions of energy | 95 | waves carry energy from one place to another |
| | | | | 190 | different forms of energy | 122 | study properties of the electromagnetic spectrum |
| | | | | 194 | energy transformations | 124 | use a spectrometer to measure wavelength of different colors of light |
| | | | | 196 | energy transformation hydroelectric plant | 128 | the equivalence of mass and energy |
| | | | | 199 | trace the energy transformations from sun to a flashing taillight | 131 | explore the concept of electric current |
| | | | | 202 | efficiency and energy conversions | 182 | investigate convection in a liquid |
| | | | | 204 | efficiency of Earth | | |
| | | | | 205 | calories in food | | |
| | | | | 205 | efficiency in biological systems | | |
| | | | | 210 | energy from the sun drives the weather on Earth | | |
| | | | | 212 | energy conversion | | |
| | | | | 212 | understand basic forms of energy | | |
| | | | | 213 | the conversion process of energy flow | | |
| | | | | 215 | energy flows in biological systems | | |
| | | | | 219 | energy flow of a model solar car | | |

Correlation to New Jersey Core Curriculum Content Standards for Science

Foundations of Physics

Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|--|---------------------|--------|
| | | | | 256 | resonant systems accumulate energy | | |
| | | | | 262 | waves transmit energy | | |
| | | | | 262 | waves are all around us | | |
| | | | | 263 | waves are a form of traveling energy | | |
| | | | | 265 | speed of a wave vs. speed of its medium | | |
| | | | | 269 | propagation of waves through continuous materials | | |
| | | | | 272 | waves transfer energy through absorption | | |
| | | | | 277 | energy of a wave | | |
| | | | | 277 | standing waves are used to store energy | | |
| | | | | 277 | waves propagate by exchanging energy between two forms | | |
| | | | | 281 | microwaves | | |
| | | | | 281 | use of microwaves in microwave ovens | | |
| | | | | 284 | which direction does a cork move on a water wave? | | |
| | | | | 286 | sound waves require matter to traverse | | |
| | | | | 294 | speed of sound in different materials | | |

Correlation to New Jersey Core Curriculum Content Standards for Science
Foundations of Physics
Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|---|---------------------|--------|
| | | | | 310 | light is a form of energy | | |
| | | | | 310 | light is a form of energy | | |
| | | | | 312 | the intensity of light | | |
| | | | | 313 | light carries information | | |
| | | | | 314 | the speed of light | | |
| | | | | 320 | photosynthesis converts light energy to chemical energy | | |
| | | | | 320 | visible light has just the right energy for life | | |
| | | | | 322 | photons are bundles of light energy | | |
| | | | | 324 | light from chemical reactions | | |
| | | | | 328 | how is light used for communication? | | |
| | | | | 356 | electromagnetic waves exchange energy between electricity and magnetic parts | | |
| | | | | 356 | light can be described in terms of waves | | |
| | | | | 357 | relationship between frequency and energy and color of light | | |
| | | | | 357 | frequency and wavelength of light | | |

Correlation to New Jersey Core Curriculum Content Standards for Science
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Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|---|---------------------|--------|
| | | | | 358 | speed of light is frequency multiplied by length | | |
| | | | | 359 | descriptions of radio waves and microwaves and infrared rays | | |
| | | | | 359 | waves of the electromagnetic spectrum | | |
| | | | | 360 | x-rays and gamma rays | | |
| | | | | 360 | visible light waves | | |
| | | | | 370 | the equivalence of energy and matter | | |
| | | | | 370 | Einstein's mass-energy formula | | |
| | | | | 373 | wave fronts of light | | |
| | | | | 375 | relate color to frequency for visible light | | |
| | | | | 378 | electrical energy | | |
| | | | | 378 | concept of electric current | | |
| | | | | 381 | how batteries work in a circuit | | |
| | | | | 382 | current flows through wires and carries energy | | |
| | | | | 384 | batteries use chemical energy | | |
| | | | | 384 | batteries use chemical reactions to provide energy to a circuit | | |

Correlation to New Jersey Core Curriculum Content Standards for Science
Foundations of Physics
Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|--|---------------------|--------|
| | | | | 390 | classifying materials as conductor or insulator or semiconductor | | |
| | | | | 393 | hybrid car battery technology | | |
| | | | | 393 | conversion of energy in regenerative braking | | |
| | | | | 395 | where does energy supplied by a battery come from? | | |
| | | | | 395 | classify conductivity of materials | | |
| | | | | 400 | batteries and cells | | |
| | | | | 400 | energy conversions in a series circuit | | |
| | | | | 408 | current definition | | |
| | | | | 421 | current is the flow of charge | | |
| | | | | 422 | negative charge of electrons and current flow | | |
| | | | | 431 | current into and out of capacitors | | |
| | | | | 451 | MRI--energy exchange by a nucleus in a magnetic field | | |
| | | | | 452 | MRI uses radio waves | | |
| | | | | 464 | electric motor uses electromagnets to convert electrical energy to mechanical energy | | |

Correlation to New Jersey Core Curriculum Content Standards for Science
Foundations of Physics
Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|--|---------------------|--------|
| | | | | 467 | electric generators transform mechanical energy into electric energy | | |
| | | | | 506 | temperature measures average kinetic energy | | |
| | | | | 509 | temperature change and thermal energy | | |
| | | | | 509 | heat of fusion | | |
| | | | | 510 | heat of vaporization | | |
| | | | | 511 | evaporation and condensation | | |
| | | | | 513 | transfer of thermal energy | | |
| | | | | 516 | refrigerator application | | |
| | | | | 520 | relationship between temp and average kinetic energy | | |
| | | | | 522 | heat conduction | | |
| | | | | 523 | heat conduction | | |
| | | | | 524 | conduction in solids and liquids and gases | | |
| | | | | 526 | convection in liquids | | |
| | | | | 527 | convection depends on speed and surface area | | |
| | | | | 528 | convection and weather | | |
| | | | | 530 | radiation | | |
| | | | | 530 | energy and radiation relationships | | |

Correlation to New Jersey Core Curriculum Content Standards for Science
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Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|--|---------------------|--------|
| | | | | 530 | electromagnetic radiation | | |
| | | | | 535 | sources of heat transfer in buildings | | |
| | | | | 535 | sources of heat transfer in buildings | | |
| | | | | 552 | explanation of pressure and energy | | |
| | | | | 580 | quantum theory and matter and energy | | |
| | | | | 597 | the energy of chemical bonds is described | | |
| | | | | 606 | energy from sunlight stored through photosynthesis | | |
| | | | | 616 | energy and radioactivity | | |
| | | | | 619 | radiation as a flow of energy | | |
| | | | | 622 | energy of x-rays | | |
| | | | | 625 | nuclear reactions can convert mass into energy | | |
| | | | | 625 | energy changes in nuclear reactions | | |
| | | | | 626 | source of energy in nuclear reactions | | |
| | | | | 627 | fusion reactions and the sun | | |
| | | | | 627 | energy of fusion reactions | | |
| | | | | 628 | energy of fission reactions | | |

Correlation to New Jersey Core Curriculum Content Standards for Science
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Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|--|---------------------|--------|
| | | | | 629 | energy is stored as mass in nuclear reactions | | |
| | | | | 647 | energy released in reactions between matter and antimatter | | |
| | | | | 647 | energy from antimatter | | |

Correlation to New Jersey Core Curriculum Content Standards for Science

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Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|----------|------------------------|---|--------------------|---|---------------------|---|
| 12.5.7.B2 by end of grade 12 | Physics | Energy Transformations | Explain that while energy can be transformed from one form to another, the total energy of a closed system is constant. | 185 | work and energy | 64 | relationship between work and energy |
| | | | | 189 | relationship between work and energy | 66 | law of conservation of energy |
| | | | | 189 | energy appears in different forms | 68 | calculate potential and kinetic energy |
| | | | | 190 | different forms of energy | 68 | find the total energy at each position |
| | | | | 190 | conversions of energy | 72 | draw an energy flow diagram |
| | | | | 191 | the formula for potential energy | 74 | investigating collisions and conservation of energy |
| | | | | 191 | the symmetry between work and energy | | |
| | | | | 192 | the formula for kinetic energy | | |
| | | | | 193 | deriving the formula for kinetic energy | | |
| | | | | 194 | the law of conservation of energy | | |
| | | | | 194 | energy transformations | | |
| | | | | 194 | conservation of energy explained | | |
| | | | | 195 | conservation of energy in a closed system | | |
| | | | | 195 | applying conservation of energy for a marble rolling on a hilly track | | |
| | | | | 196 | energy transformation hydroelectric plant | | |
| | | | | 197 | conservation of energy for Hoover Dam | | |

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Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|--|---------------------|--------|
| | | | | 202 | efficiency and energy conversions | | |
| | | | | 203 | efficiency and conservation of energy | | |
| | | | | 205 | efficiency in biological systems | | |
| | | | | 206 | connection between efficiency and time | | |
| | | | | 212 | energy conversion | | |
| | | | | 212 | understand basic forms of energy | | |
| | | | | 213 | the conversion process of energy flow | | |
| | | | | 215 | energy flows in biological systems | | |
| | | | | 219 | energy flow of a model solar car | | |
| | | | | 227 | kinetic energy conservation for elastic collisions | | |
| | | | | 253 | harmonic motion involves both potential and kinetic energy | | |
| | | | | 256 | resonant systems accumulate energy | | |
| | | | | 277 | waves propagate by exchanging energy between two forms | | |
| | | | | 310 | light is a form of energy | | |

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Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|--|---------------------|--------|
| | | | | 320 | photosynthesis converts light energy to chemical energy | | |
| | | | | 322 | photons are bundles of light energy | | |
| | | | | 324 | light from chemical reactions | | |
| | | | | 356 | electromagnetic waves exchange energy between electricity and magnetic parts | | |
| | | | | 370 | relationship and conservation of mass and energy | | |
| | | | | 378 | electrical energy | | |
| | | | | 384 | batteries use chemical energy | | |
| | | | | 393 | conversion of energy in regenerative braking | | |
| | | | | 400 | energy conversions in a series circuit | | |
| | | | | 451 | MRI--energy exchange by a nucleus in a magnetic field | | |
| | | | | 464 | electric motor uses electromagnets to convert electrical energy to mechanical energy | | |
| | | | | 467 | electric generators transform mechanical energy into electric energy | | |

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Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|----------------------------|----------|--------|------------------------|--------------------|--|---------------------|--------|
| | | | | 469 | energy conservation and Faraday's law | | |
| | | | | 515 | thermodynamics and conservation of energy | | |
| | | | | 552 | conservation of energy in fluids | | |
| | | | | 552 | explanation of pressure and energy | | |
| | | | | 553 | energy conservation and Bernoulli's equation | | |
| | | | | 619 | radiation as a flow of energy | | |
| | | | | 622 | energy of x-rays | | |
| | | | | 629 | conservation of energy in nuclear reactions | | |
| | | | | 647 | energy from antimatter | | |

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Student Text and Investigation Manual

| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|-----------------|---------------------------|--|----------------------------|--|-----------------------------|---|
| 12.5.7.B3 by end of grade 12 | Physics | Energy Transformations | Recognize that whenever mechanical energy is transformed, some heat is dissipated and is therefore unavailable for use. | 188 | for all machines work out cannot exceed work in | 64 | compare output and input work |
| | | | | 195 | friction can divert some energy | 67 | friction as a source of energy dissipation |
| | | | | 195 | frictional energy converted to heat | | |
| | | | | 202 | definition of efficiency | | |
| | | | | 203 | efficiency explained | | |
| | | | | 203 | how friction affects machines | | |
| | | | | 203 | friction converts input work to heat | | |
| | | | | 206 | friction and the arrow of time | | |
| | | | | 216 | tidal energy represents frictional energy from the Earth-moon system | | |
| | | | | 245 | friction causes damping in oscillators | | |
| | | | | 393 | efficiency of hybrid cars | | |

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| Standard #: Grade level | Standard | Strand | Cumulative Progress | student text pg | detail | investigation pg | detail |
|------------------------------------|-----------------|---------------------------|--|----------------------------|--|-----------------------------|--|
| 12.5.7.B4 by end of grade 12 | Physics | Energy Transformations | Explain the nature of electromagnetic radiation and compare the components of the electromagnetic spectrum from radio waves to gamma rays. | 281 | microwaves | 122 | study properties of the electromagnetic spectrum |
| | | | | 286 | sound waves require matter to traverse | | |
| | | | | 311 | fluorescent bulbs create UV light | | |
| | | | | 320 | the energy of IR and UV light | | |
| | | | | 320 | visible light has just the right energy for life | | |
| | | | | 359 | description and examples of infrared waves | | |
| | | | | 359 | waves of the electromagnetic spectrum | | |
| | | | | 360 | description and examples of ultraviolet waves | | |
| | | | | 360 | visible light waves | | |
| | | | | 530 | electromagnetic radiation | | |
| | | | | 531 | thermal radiation and infrared light | | |
| | | | | 624 | UV light is ionizing radiation | | |