

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page	
I.I.I.01 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results.	Describe the essential components of an investigation, including appropriate methodologies, proper equipment, and safety precautions.		29 set up the ultimate pulley	
					50 follow the scientific method	
				20	inquiry is a process of learning by asking questions	50 write a procedure
					80 set up the straight track	
				49	writing lab procedures	91 safety note
				49	control and experimental variables	94 dependent and independent variables
				50	dependent and independent variables in graphs	94 plan three experiments to determine which variable affects the period of a pendulum
				52	recognizing patterns and cause and effect relationships	94 determine which variable has the greatest effect
				273	changing the natural frequency of a stretched rubber band	97 design and test a way to increase natural frequency
				454	making a simple capacitor	102 what is it that moves in the case of a wave?
		103 what effect does changing the tension have?				
		150 safety precautions				
		152 safety precautions				
		176 safety note				
		186 safety note				
		187 electromagnet safety				

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
					194 variables that affect the performance of the generator 218 safety tip 226 gas pressure safety note

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page	
I.1.1.02 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results.	Design and conduct scientific investigations.	264	finding a basic cycle of harmonic motion	each investigation begins with a Key Question
				315	demonstrating the Doppler effect	29 set up the ultimate pulley
				454	making a simple capacitor	50 perform experiment
				478	an experiment with a wire and compass	77 investigate motion on a roller coaster
				485	building an electromagnet with wire and a nail	77 studying motion of ball on loop track
				489	experiment demonstrating electromagnetic induction	80 set up the straight track
						80 investigate motion on a roller coaster
						94 plan three experiments to determine which variable affects the period of a pendulum
		94 design an experiment				
		97 select appropriate technology to make measurements				
		97 design and test a way to increase natural frequency				
		150 choose circuit parts to light a bulb				

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
I.1.1.03 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results.	Use appropriate technologies to collect, analyze, and communicate scientific data (e.g., computers, calculators, balances, and microscopes).	32	measuring distance	7	estimating length
				36	reading a digital timer	10	using the DataCollector
				46	accuracy and precision of measurements	10	using photogate
				113	the force platform	11	accuracy and resolution and printing
				405	using a multimeter to measure voltage	12	using devices to measure mass
				407	measuring current with an ammeter or multimeter	14	using the DataCollector and velocity sensor
				409	using a multimeter to measure resistance	25	use the DataCollector and velocity sensor
				454	making a simple capacitor	27	use the DataCollector and velocity sensor
				526	Celsius and Fahrenheit thermometers	29	set up the ultimate pulley
				527	how thermometers work	47	use the DataCollector and photogates
				50	measure and record the distance		
				51	use a spring scale		
				59	use the DataCollector and photogate		
				70	use a spring scale		
				70	measure input and output forces		
				77	use the DataCollector and photogate		

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
					80 use the DataCollector and photogate
					80 measure vertical distance
					80 set up the straight track
					94 measure the length of the string
					94 use the DataCollector and photogate
					97 select appropriate technology to make measurements
					97 design and test a way to increase natural frequency
					100 use photogate and DataCollector to measure the period
					102 use a spring scale to measure tension of string
					130 study reflection with a mirror
					134 use mirrors and lenses to learn how images are formed
					150 choose circuit parts to light a bulb
					152 use a multimeter to measure current
					153 use a multimeter to measure voltage

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
					157 use a multimeter to measure current and voltage
					162 use a multimeter
					164 use the multimeter
					191 use a multimeter
					192 use a multimeter to measure voltage
					193 use a multimeter
					194 use a photogate and DataCollector
					198 use a multimeter
					200 use a multimeter
					212 measure the temperature
					226 check the pressure with your gauge
					226 use a digital balance

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
I.1.1.04 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results.	Convey results of investigations using scientific concepts, methodologies, and expressions.	25	the usefulness of phlogiston theory despite being incorrect	18	describe the graph
				49	writing lab procedures	18	what do the results tell you?
				50	graphs are a way of representing data	18	create a graph
				50	constructing a graph	24	uniform acceleration model
				51	graphical models	26	create an algebraic model
				51	checking a graphical model's accuracy	41	make a graph
				52	recognizing patterns and cause and effect relationships	42	make a graph
				52	recognizing patterns using graphs	50	sketch four graphs
				82	creating the acceleration formula from experiments	50	write a procedure
				88	developing the formulas for a model of motion with constant acceleration	50	what would happen if...?
				93	parachutes and air resistance	50	perform experiment
				125	evaluating perpetual motion claims	50	create algebraic model
				264	finding a basic cycle of harmonic motion	58	write a formula
				268	understanding graphs of harmonic motion	65	create a graph
						74	as mechanical advantage increases what happens to length of pulled string?
		77	investigate motion on a roller coaster				
		78	what does the graph tell you?				
		78	create a graph of speed vs. position				

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				304	write a formula relating velocity of wave to period and wavelength
				312	the process of digital sound reproduction
				326	comparison of wave forms from guitar sounds
				328	explain why hearing can be damaged by loud sounds
				329	decibel level vs. frequency graph for human hearing
				334	light intensity follows an inverse square law
				433	the waveform of AC electricity
				449	diagramming electric fields using field lines
				465	diagramming magnetic fields using magnetic field lines
				478	an experiment with a wire and compass
				485	building an electromagnet with wire and a nail
				489	experiment demonstrating electromagnetic induction
				80	investigate motion on a roller coaster
				92	explain your observations
				94	analyze data
				94	make three different graphs
				100	sketch a graph
				100	explain how force applied causes the response
				103	what effect does changing the tension have?
				103	explain why higher tension makes waves move faster
				105	explain how wind might cause big waves in water
				107	give an equation that describes your observations
				110	reliability of a double-blind test
				110	did the method give an accurate result?
				124	explain how the colored filters work
				153	what conclusions can you draw?

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				501 current vs.voltage graph for a transistor	154 analyze data and explain a rule 154 did battery voltage change? 157 graph voltage vs. current 158 graph voltage vs. current 178 make a graph of voltage vs. time 187 create a graph 195 make a graph of voltage vs. number of magnets 198 make a current vs. voltage graph for the diode 205 display information you found for your element 223 Bernoulli's equation

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
I.1.1.05 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Use accepted scientific methods to collect, analyze, and interpret data and observations and to design and conduct scientific investigations and communicate results.	Understand how scientific theories are used to explain and predict natural phenomena (e.g., plate tectonics, ocean currents, structure of atom).	17	the search for scientific knowledge	3	inquiry and optical illusions
				18	scientific theories and facts	5	scientific evidence and sound
				20	learning physics through inquiry	24	model for uniform accelerated motion
				22	the nature of scientific knowledge	38	designing an experiment
				123	a model for friction	41	use your graph to make a prediction
				124	a model for static friction	42	use your graph to make a prediction
				352	optics and optical instruments	47	predict exact landing location
				514	the binary number system and its use in computers	77	predict where the car moves fastest
				520	since wood is created from other matter it must not be a fundamental substance	153	predict what the current will be
				521	development of atomic theory		
				582	deep water submarine Alvin application		
				644	proof of Einstein's theory of general relativity		
				645	astronomers find black holes by what is around them		

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
I.I.II.01 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected.	Understand how scientific process produce valid, reliable results.	17	the search for scientific knowledge		
				18	scientific theories and facts	3	inquiry and optical illusions
				20	learning physics through inquiry	5	scientific evidence and sound
				22	the nature of scientific knowledge	38	designing an experiment
				25	putting forth ideas and then testing them	50	test your prediction
				25	the usefulness of phlogiston theory despite being incorrect	50	follow the scientific method
				25	the usefulness of phlogiston theory despite being incorrect	77	where does the marble move the fastest?
				51	checking a graphical model's accuracy	94	design an experiment
				93	parachutes and air resistance	110	did the method give an accurate result?
				125	evaluating perpetual motion claims	110	reliability of a double-blind test
				345	using glow-in-the-dark plastic to demonstrate photon energy levels	127	do your observations support this hypothesis?
				445	charge by friction		
				582	deep water submarine Alvin application		
644	proof of Einstein's theory of general relativity						

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				645 astronomers find black holes by what is around them	

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
I.I.II.02 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected.	Use scientific reasoning and valid logic.	17	hypotheses and the importance of experiments	50	test your prediction
				20	inquiry is a process of learning by asking questions	50	perform experiment
				25	putting forth ideas and then testing them	57	formulate a hypothesis
				25	the usefulness of phlogiston theory despite being incorrect	77	form a hypothesis
				51	checking a graphical model's accuracy	77	where does the marble move the fastest?
				52	recognizing patterns and cause and effect relationships	77	investigate motion on a roller coaster
				93	parachutes and air resistance	80	investigate motion on a roller coaster
				125	evaluating perpetual motion claims	91	write a hypothesis
				264	finding a basic cycle of harmonic motion	102	what is it that moves in the case of a wave?
				345	using glow-in-the-dark plastic to demonstrate photon energy levels	103	what effect does changing the tension have?
				445	charge by friction	110	did the method give an accurate result?
				478	an experiment with a wire and compass	110	reliability of a double-blind test
				485	building an electromagnet with wire and a nail	127	do your observations support this hypothesis?

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				489 experiment demonstrating electromagnetic induction	

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Standard #: Strand	Standard	Benchmark	Performance Standard		Volume One Student Text Page	Volume Two Investigation Manual Page	
I.I.II.03 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected.	Understand how new data and observations can result in new scientific knowledge.	46	why accuracy and precision are important	18	what do the results tell you?
				48	Galileo and Newton conducted experiments with balls on ramps	24	compare calculation with graph estimate
				51	using a graphical model to make a prediction and checking the model's accuracy	24	how do you measured positions compare to model?
				51	checking a graphical model's accuracy	50	what would happen if...?
				73	analyzing motion with video and strobe photography	50	how does the measurement compare to your prediction?
				100	Newton's laws of motion	92	explain your observations
				103	Newton's discovery of the connection between force and mass and acceleration	100	explain how force applied causes the response
				125	evaluating perpetual motion claims	103	explain why higher tension makes waves move faster
				134	relationship between science and engineering and technology	105	explain how wind might cause big waves in water
				174	Sir Isaac Newton and law of universal gravitation	110	did the method give an accurate result?
				194	bicycle physics application	110	reliability of a double-blind test
				265	oscillators are used in communications and music and clocks	124	explain how the colored filters work
						132	are there differences between your prediction and measurement?

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				285 waves can carry information	153 what conclusions can you draw?
				319 frequency spectrum	154 analyze data and explain a rule
				328 explain why hearing can be damaged by loud sounds	
				371 Galileo and telescopes	
				372 Newtonian reflecting telescope	
				391 technological advances have allowed discovery of the expanding universe	
				394 holography application	
				404 Ben Franklin and current	
				414 hybrid gas/electric cars application	
				442 Charles-Augustin de Coulomb	
				451 electron beam accelerators	
				494 maglev train application	
				495 how magplanes levitate	
				514 computers and electronic addition of numbers application	
				538 refrigerator application	
				582 deep water submarine Alvin application	

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				602 Newton and classical physics	
				607 laser application	
				614 Marie Curie	
				615 Henri Bequerel and beta rays	
				615 smoke detectors	
				641 research on future of the universe	

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I.I.II.04 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected.	Critically analyze an accepted explanation by reviewing current scientific knowledge.	17	the search for scientific knowledge	3	inquiry and optical illusions
				18	scientific theories and facts	5	scientific evidence and sound
				18	what is a scientific theory?	38	designing an experiment
				18	do not confuse theory with opinion	59	does your experiment provide confirmation?
				20	learning physics through inquiry	78	does this agree with your hypothesis?
				22	the nature of scientific knowledge	127	how does what you observed support the quantum theory?
				49	writing procedures in a lab notebook helps make sure your results are repeatable	142	communicate your findings
				158	determining formula for acceleration on a ramp		
				210	perpetual motion machines		
				389	speed of light did not behave as expected for Michelson and Morley		
				391	proof of time dilation		
				397	explain Thomas Young's demonstration of the wave nature of light		
				582	deep water submarine Alvin application		

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				644 proof of Einstein's theory of general relativity	
				645 astronomers find black holes by what is around them	

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I.I.II.05 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected.	Examine investigations of current interest in science (e.g., superconductivity, molecular machines, age of the universe).	53	use of nanotechnology	147 when does special relativity become important?
				73	analyzing motion with video and strobe photography	
				94	antilock brakes application	
				134	relationship between science and engineering and technology	
				134	impact of technology	
				134	designing a bridge	
				160	use of robots	
				177	geostationary satellites	
				194	bicycle physics application	
				218	hydroelectric power application	
				231	range of power for common devices	
				238	energy from ocean tides	
				239	research into tidal power	
				250	seat belts and air bags	
				257	jet engines application	
				265	oscillators are used in communications and music and clocks	
279	quartz crystals application					
285	waves can carry information					

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				315	
				uses of Doppler radar	
				333	
				invention of electric light	
				336	
				Einstein's theory of relativity	
				347	
				the printing press	
				371	
				the telescope	
				388	
				relationship between matter and energy and time and space	
				389	
				speed of light paradox	
				390	
				speed and time and clocks	
				391	
				consequences of time dilation	
				391	
				technological advances have allowed discovery of the expanding universe	
				393	
				simultaneity depends on the relative motion of your frame of reference	
				394	
				holography application	
				400	
				importance of electricity	
				414	
				hybrid gas/electric cars application	
				414	
				hybrid gas/electric cars application	
				435	
				wiring application	

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				451	electron beam accelerators
				462	scientists have never found single magnetic poles
				473	MRI application
				494	maglev train application
				495	how magplanes levitate
				512	why computers are useful
				514	computers and electronic addition of numbers application
				538	refrigerator application
				556	energy-efficient building application
				582	deep water submarine Alvin application
				590	understanding how gravity works inside atoms
				605	the meaning of the uncertainty principle
				607	laser application
				615	smoke detectors
				623	creation of CAT scans
				631	nuclear power application
				637	areas of active research in physics

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				639	
				the big bang	
				640	
				unresolved questions of history of universe	
				641	
				research on future of the universe	
				641	
				research on future of the universe	
				642	
				Einstein's theory and gravity and inertial mass	
				644	
				general relativity and curved space-time	
				645	
				black holes and general relativity	

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page	
I.I.II.06 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Understand that scientific processes produce scientific knowledge that is continually evaluated, validated, revised, or rejected.	Examine the scientific processes and logic used in investigations of past events, investigations that can be planned in advance but are only done once, and investigations of phenomena that can be repeated easily and frequently.	17	the search for scientific knowledge	each investigation begins with a Key Question
				18	scientific theories and facts	3 inquiry and optical illusions
				20	learning physics through inquiry	5 scientific evidence and sound
				22	the nature of scientific knowledge	38 designing an experiment
				264	finding a basic cycle of harmonic motion	50 perform experiment
				315	demonstrating the Doppler effect	77 investigate motion on a roller coaster
				478	an experiment with a wire and compass	77 studying motion of ball on loop track
				485	building an electromagnet with wire and a nail	80 investigate motion on a roller coaster
				489	experiment demonstrating electromagnetic induction	94 plan three experiments to determine which variable affects the period of a pendulum
				582	deep water submarine Alvin application	94 design an experiment
				641	research on future of the universe	
				644	proof of Einstein's theory of general relativity	
				645	astronomers find black holes by what is around them	

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I.I.III.01 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Use mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions.	Create multiple displays of data to analyze and explain the relationships in scientific investigations.	50	constructing a graph	18	create a graph
				51	graphical models	18	describe the graph
				82	creating the acceleration formula from experiments	24	uniform acceleration model
				88	developing the formulas for a model of motion with constant acceleration	26	create an algebraic model
						28	record position and time data
				164	finding x and y components of velocity for model rocket	41	make a graph
						42	make a graph
				304	write a formula relating velocity of wave to period and wavelength	50	sketch four graphs
						50	create algebraic model
				312	the process of digital sound reproduction	58	write a formula
						65	create a graph
334	light intensity follows an inverse square law	78	create a graph of speed vs. position				
		78	record data in table				
433	the waveform of AC electricity	83	record data in table				
		94	record your data in table				
		94	create data table for self-designed experiment				
		94	make three different graphs				
		100	sketch a graph				
		107	give an equation that describes your observations				

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					157 graph voltage vs. current 158 graph voltage vs. current 178 make a graph of voltage vs. time 187 create a graph 195 make a graph of voltage vs. number of magnets 198 make a current vs. voltage graph for the diode 223 Bernoulli's equation

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
I.I.III.02 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Use mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions.	Use mathematical models to describe, explain, and predict natural phenomena.	50	graphs are a way of representing data	24	uniform acceleration model
				51	using a graphical model to make a prediction and checking the model's accuracy	24	compare calculation with graph estimate
				52	recognizing patterns using graphs	24	how do you measured positions compare to model?
				82	creating the acceleration formula from experiments	26	create an algebraic model
				88	developing the formulas for a model of motion with constant acceleration	50	create algebraic model
				268	understanding graphs of harmonic motion	50	how does the measurement compare to your prediction?
				304	write a formula relating velocity of wave to period and wavelength	58	write a formula
				319	frequency spectrum	107	give an equation that describes your observations
				326	comparison of wave forms from guitar sounds	132	are there differences between your prediction and measurement?
				329	decibel level vs. frequency graph for human hearing	223	Bernoulli's equation
				334	light intensity follows an inverse square law		
				449	diagramming electric fields using field lines		

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
				465 501	diagramming magnetic fields using magnetic field lines current vs.voltage graph for a transistor		
I.I.III.03 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Use mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions.	Use technologies to quantify relationships in scientific hypotheses.	32 46 264 478 485 489	measuring distance accuracy and precision of measurements finding a basic cycle of harmonic motion an experiment with a wire and compass building an electromagnet with wire and a nail experiment demonstrating electromagnetic induction	7 11 50 50 70 77 80 80 94 97 150	estimating length accuracy and resolution and printing perform experiment measure and record the distance measure input and output forces investigate motion on a roller coaster investigate motion on a roller coaster measure vertical distance measure the length of the string select appropriate technology to make measurements choose circuit parts to light a bulb

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
I.I.III.04 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Use mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions.	Identify and apply measurement techniques and consider possible effects of measurement errors.	32	measuring distance	7	estimating length
				46	why accuracy and precision are important	11	collecting data with precision
				46	accuracy and precision of measurements	11	accuracy and resolution and printing
				49	controlling variables in experiments	50	discuss sources of error
						50	measure and record the distance
						52	discuss sources of errors
						70	measure input and output forces
		80	measure vertical distance				
		94	measure the length of the string				

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
I.I.III.05 Scientific Thinking and Practice	Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.	Use mathematical concepts, principles, and expressions to analyze data, develop models, understand patterns and relationships, evaluate findings, and draw conclusions.	Use mathematics to express and establish scientific relationships.	50	graphs are a way of representing data	24	uniform acceleration model
				52	recognizing patterns using graphs	26	create an algebraic model
				82	creating the acceleration formula from experiments	50	create algebraic model
				88	developing the formulas for a model of motion with constant acceleration	58	write a formula
				107	give an equation that describes your observations		
				223	Bernoulli's equation		
				268	understanding graphs of harmonic motion		
				304	write a formula relating velocity of wave to period and wavelength		
				326	comparison of wave forms from guitar sounds		
				329	decibel level vs. frequency graph for human hearing		
				334	light intensity follows an inverse square law		
449	diagramming electric fields using field lines						
465	diagramming magnetic fields using magnetic field lines						
501	current vs. voltage graph for a transistor						

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.II.01 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the transformation and transmission of energy and how energy and matter interact.	Identify different forms of energy, including kinetic, gravitational, chemical, thermal, nuclear, and electromagnetic.	211	energy appears in different forms	77	potential to kinetic energy conversions on a loop track
				212	different forms of energy	81	calculate potential and kinetic energy
				213	the formula for potential energy	86	potential to kinetic energy conversion in a pendulum
				214	the formula for kinetic energy	101	potential to kinetic energy conversions of a pendulum
				215	deriving the formula for kinetic energy		
				216	energy transformations		
				218	energy transformation hydroelectric plant		
				221	kinetic and potential energy conversions while bouncing in a trampoline		
				234	understand basic forms of energy		
				234	energy flow in a pendulum		
				267	kinetic to potential energy changes in motion of an oscillator		
				275	oscillators exchange energy back and forth between potential and kinetic		
				275	harmonic motion involves both potential and kinetic energy		
				332	light is a form of energy		

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				344	
					photons are bundles of light energy
				400	
					electrical energy
				406	
					batteries use chemical energy
				574	
					explanation of pressure and energy
				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 Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.II.02 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the transformation and transmission of energy and how energy and matter interact.	Explain how thermal energy (heat) consists of the random motion and vibrations of atoms and molecules and is measured by temperature.	217	frictional energy converted to heat	212	measure the temperature
				225	friction converts input work to heat		
				526	Celsius and Fahrenheit thermometers		
				526	temperature scales and Fahrenheit-Celsius conversions		
				527	how thermometers work		
				527	measuring temperature		
				528	temperature measures average kinetic energy		
				529	the Kelvin scale and converting between Kelvin and Celsius		
				531	temp vs. time graph for phase change of ice to water		
				531	temperature change and thermal energy		
				531	heat of fusion		
				532	heat of vaporization		
				533	evaporation and condensation		
				535	balance of thermal energy		
				535	joules and calories and Btus		

Correlation to New Mexico Science Content Standards, 9th - 12th grade

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				535	
					transfer of thermal energy
				541	
					temp vs. time graphs for various materials
				541	
					understanding Fahrenheit and Celsius and Kelvin
				542	
					relationship between temp and average kinetic energy
				544	
					thermal equilibrium
				545	
					thermal conductors and insulators
				555	
					using Kelvin for radiation calculations
				556	
					R-value
				559	
					heat flow between objects of different temperature
				560	
					using heat conduction equation to calculate R-value
				580	
					using temperature in Kelvins for Charles' law

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.II.03 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the transformation and transmission of energy and how energy and matter interact.	Understand that energy can change from one form to another and know that energy is conserved in these changes.	212	conversions of energy	78	law of conservation of energy
				216	the law of conservation of energy	81	find the total energy at each position
				216	energy transformations	86	draw an energy flow diagram
				216	conservation of energy explained	88	investigating collisions and conservation of energy
				217	applying conservation of energy for a marble rolling on a hilly track		
				217	conservation of energy in a closed system		
				218	energy transformation hydroelectric plant		
				219	conservation of energy for Hoover Dam		
				224	efficiency and energy conversions		
				225	efficiency and conservation of energy		
				227	efficiency in biological systems		
				228	connection between efficiency and time		
				234	energy conversion		
				235	the conversion process of energy flow		
237	energy flows in biological systems						

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				241	
				energy flow of a model solar car	
				249	
				kinetic energy conservation for elastic collisions	
				278	
				resonant systems accumulate energy	
				299	
				waves propagate by exchanging energy between two forms	
				342	
				photosynthesis converts light energy to chemical energy	
				346	
				light from chemical reactions	
				378	
				electromagnetic waves exchange energy between electricity and magnetic parts	
				392	
				relationship and conservation of mass and energy	
				415	
				conversion of energy in regenerative braking	
				422	
				energy conversions in a series circuit	
				473	
				MRI--energy exchange by a nucleus in a magnetic field	

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				486 electric motor uses electromagnets to convert electrical energy to mechanical energy	
				489 electric generators transform mechanical energy into electric energy	
				491 energy conservation and Faraday's law	
				537 thermodynamics and conservation of energy	
				574 conservation of energy in fluids	
				575 energy conservation and Bernoulli's equation	
				629 conservation of energy in nuclear reactions	

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.II.04 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the transformation and transmission of energy and how energy and matter interact.	Understand how heat can be transferred by conduction, convection, and radiation, and how heat conduction differs in conductors and insulators.	544	heat conduction	212	investigate conduction
				545	heat conduction	215	observe free and forced convection
				546	conduction in solids	215	investigate convection in a liquid
				546	conduction in solids and liquids and gases	216	observing forced convection
				547	the heat conduction equation	217	explore properties of thermal radiation
				548	convection	217	investigate radiant heat
				548	free and forced convection	218	observing radiant energy in action
				548	convection in liquids		
				548	convection		
				549	convection depends on speed and surface area		
				550	convection and weather		
				551	heat transfer coefficient and the convection equation		
				552	radiation		
				555	Stefan-Boltzmann formula		
				557	sources of heat transfer in buildings		
				560	using heat conduction equation to calculate R- value		
				560	convection equation problem		

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.II.05 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the transformation and transmission of energy and how energy and matter interact.	Explain how heat flows in terms of the transfer of vibrational motion of atoms and molecules from hotter to colder regions.	531	temperature change and thermal energy	212	investigate conduction
				534	temperature and thermal energy and heat	215	investigate convection in a liquid
				535	transfer of thermal energy	216	observing forced convection
				535	balance of thermal energy	217	investigate radiant heat
				544	heat conduction	218	observing radiant energy in action
				544	thermal equilibrium		
				545	heat conduction		
				545	thermal conductors and insulators		
				546	conduction in solids and liquids and gases		
				548	convection in liquids		
				549	convection depends on speed and surface area		
				550	convection and weather		
				552	radiation		
				557	sources of heat transfer in buildings		
				559	heat flow between objects of different temperature		

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.II.06 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the transformation and transmission of energy and how energy and matter interact.	Understand that the ability of energy to do something useful (work) tends to decrease as energy is converted from one form to another.	207	work and energy	74	studying the concept of work
				207	physics definition of work	75	compare output and input work
				208	the work done by a force	75	relationship between work and energy
				209	work done against gravity	80	friction as a source of energy dissipation
				210	for all machines work out cannot exceed work in	86	draw an energy flow diagram
				211	relationship between work and energy		
				212	conversions of energy		
				213	the symmetry between work and energy		
				215	deriving the formula for kinetic energy		
				216	energy transformations		
				217	friction can divert some energy		
				218	energy transformation hydroelectric plant		
				221	concept of work		
				222	calculate work done		
				224	efficiency and energy conversions		
				225	how friction affects machines		
				227	efficiency in biological systems		

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				228	
					friction and the arrow of time
				234	
					energy conversion
				235	
					the conversion process of energy flow
				238	
					tidal energy represents frictional energy from the Earth-moon system
				241	
					energy flow of a model solar car
				267	
					friction causes damping in oscillators
				278	
					resonant systems accumulate energy
				299	
					waves propagate by exchanging energy between two forms
				342	
					photosynthesis converts light energy to chemical energy
				346	
					light from chemical reactions
				378	
					electromagnetic waves exchange energy between electricity and magnetic parts
				415	
					conversion of energy in regenerative braking

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				422 energy conversions in a series circuit	
				473 MRI--energy exchange by a nucleus in a magnetic field	
				486 electric motor uses electromagnets to convert electrical energy to mechanical energy	
				489 electric generators transform mechanical energy into electric energy	

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.II.07 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the transformation and transmission of energy and how energy and matter interact.	Understand that electromagnetic waves carry energy that can be transferred when they interact with matter.	284	waves transmit energy	108	waves carry energy from one place to another
				285	waves are a form of traveling energy		
				294	waves transfer energy through absorption	127	photons and quantum theory
				299	energy of a wave		
				332	light is a form of energy		
				334	the intensity of light		
				335	light carries information		
				336	the speed of light		
				344	the photon theory of light		
				345	photons and the intensity of light		
				346	when the photon theory of light is useful		
				350	how is light used for communication?		
				378	light can be described in terms of waves		
				379	frequency and wavelength of light		
				380	speed of light is frequency multiplied by length		
				395	wave fronts of light		
				552	energy and radiation relationships		

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				603 quantum or photon theory of light	
				622 x-rays are photons	

Correlation to New Mexico Science Content Standards, 9th - 12th grade

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.II.08 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the transformation and transmission of energy and how energy and matter interact.	Describe the characteristics of electromagnetic waves and other waves.	286	frequency and amplitude and wavelength in waves	101	if frequency is increased what happens to total energy?
				286	basic properties of frequency and wavelength and amplitude	102	study characteristics of a wave pulse on a string
				287	concept of speed of a wave	103	measure speed of a wave pulse
				288	formula for speed of a wave	103	study the speed of the wave pulse
				289	transverse and longitudinal waves	104	is your water wave transverse or longitudinal?
				290	creating plane waves and circular waves	106	investigate frequency and wavelength
				299	energy of a wave is proportional to frequency and amplitude	107	investigate the wavelength of standing waves
				300	wavelength of a standing wave	107	investigate the frequency of standing waves
				300	modes of a wave	142	study properties of the electromagnetic spectrum
				301	modes of vibration		
				304	describe relationship between wave characteristics	145	study the polarization of a transverse spring wave
				305	type of wave represented by a spring		
				308	properties of sound waves		
				309	frequency and pitch of sound		

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CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				310	
					relationship of loudness and amplitude and pressure in sound wave
				313	
					pressure and amplitude of sound waves
				314	
					importance of wavelength of sound waves
				314	
					frequency and wavelengths of sound
				314	
					sound is a longitudinal wave
				322	
					pitch and frequency in music
				325	
					design of a guitar
				330	
					wave amplitude and harmonics of tuning fork and musical instrument
				333	
					fluorescent bulbs create UV light
				342	
					visible light has just the right energy for life
				342	
					the energy of IR and UV light
				381	
					waves of the electromagnetic spectrum
				381	
					description and examples of infrared waves
				382	
					description and examples of ultraviolet waves

Correlation to New Mexico Science Content Standards, 9th - 12th grade

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				382 visible light waves	
				553 thermal radiation and infrared light	
				624 UV light is ionizing radiation	

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.II.09 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the transformation and transmission of energy and how energy and matter interact.	Know that each kind of atom or molecule can gain or lose energy only in discrete amounts.	332	how we see	127	photons and quantum theory
				339	how the human eye sees color	139	apply the concept of chromatic aberration
				340	how we perceive color	233	quantum theory and electrons
				341	we see mostly reflected light		
				344	the photon theory of light		
				345	photons and the intensity of light		
				346	when the photon theory of light is useful		
				346	the process of how light is reflected		
				367	chromatic aberration and spherical aberration		
				598	quantum states		
				599	energy levels and quantum states		
				600	quantum state holds one electron		
				601	quantum states are called orbitals in chemistry		
				603	quantum or photon theory of light		
				604	quantum theory		
				606	quantum theory and probability		

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				610 quantum states and energy levels	
				622 x-rays are photons	

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.II.10 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the transformation and transmission of energy and how energy and matter interact.	Explain how wavelengths of electromagnetic radiation can be used to identify atoms, molecules, and the composition of stars.	384	diffraction patterns and the spectrometer	126	all light is produced by atoms
				596	Neils Bohr's theory	233	quantum theory and electrons
				596	emission/absorption spectrum	233	absorption and emission of light by atomic electrons
				597	spectral analysis of the sun		
				597	spectrum of hydrogen		
				597	using the Balmer formula		
				598	quantum states		
				598	Neils Bohr		
				598	quantum numbers and the Balmer formula		
				599	energy levels explain spectral lines		
				599	energy levels and quantum states		
				599	Balmer's formula and energy levels		
				600	quantum state holds one electron		
				601	quantum states are called orbitals in chemistry		
				604	quantum theory		
606	quantum theory and probability						

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				610 quantum states and energy levels 638 spectral-line patterns and red shift	

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.II.11 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the transformation and transmission of energy and how energy and matter interact.	Understand the concept of equilibrium.	108	zero net force in equilibrium	51	forces in equilibrium
				121	weight in equilibrium problems	63	explore rotational equilibrium and net torque
				128	definition of equilibrium	96	restoring forces and equilibrium
				130	applications of equilibrium		
				131	restoring force of a spring		
				132	Hooke's law and restoring force of a spring		
				132	restoring force of a spring		
				133	equilibrium and reaction or normal forces		
				133	solid materials exert restoring force		
				137	understanding of equilibrium		
				155	equilibrium of forces and balancing forces		
				184	combining torques to find the net torque		
				185	rotational equilibrium		
				185	in rotational equilibrium the net torque is zero		
				197	explain rotational equilibrium		
236	steady state energy balance of Earth						

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				270	
					harmonic motion and equilibrium
				272	
					stable and unstable equilibrium
				273	
					restoring forces and inertia affect natural frequency
				286	
					equilibrium level of waves
				544	
					thermal equilibrium

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.III.01 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the motion of objects and waves, and the forces that cause them.	Know that there are four fundamental forces in nature: gravitation, electromagnetism, weak nuclear force, and strong nuclear force.	90	free fall and acceleration due to gravity	25	investigate the effect of gravity
				91	motion formulas for free fall	47	analyze the motion of a marble in 2 dimensions
				92	solving problems with free fall	49	investigate the range of a projectile
				93	acceleration of gravity does not depend on mass	50	create and test a model to predict the landing spot of a projectile
				119	strength of gravity on Earth and Jupiter		
				120	gravity and acceleration and weightlessness		
				146	projectiles and trajectories		
				150	gravity only accelerates vertical motion		
				151	vertical motion of a projectile		
				152	projectiles launched at an angle		
				153	range of projectiles		
				156	resolving force of gravity in ramp coordinates		
				157	acceleration down an inclined plane		
				163	effects of gravity on motion of a projectile		

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				174	
					law of universal gravitation and orbital motion
				176	
					orbits and gravitational force
				177	
					centripetal force and the law of universal gravitation combine to form the orbit equation
				180	
					compare projectile motion to orbital motion
				187	
					the motion of a tossed object
				188	
					centers of mass and gravity may differ
				209	
					work done against gravity
				213	
					potential energy comes from gravity
				590	
					forces in the atom
				626	
					strong force and electromagnetic force in the nucleus
				649	
					four forces in nature

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
II.I.III.02 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the motion of objects and waves, and the forces that cause them.	Know that every object exerts gravitational force on every other object, and how this force depends on the masses of the objects and the distance between them.	90 free fall and acceleration due to gravity 91 motion formulas for free fall 92 solving problems with free fall 93 acceleration of gravity does not depend on mass 119 strength of gravity on Earth and Jupiter 120 gravity and acceleration and weightlessness 146 projectiles and trajectories 150 gravity only accelerates vertical motion 151 vertical motion of a projectile 152 projectiles launched at an angle 153 range of projectiles 156 resolving force of gravity in ramp coordinates 157 acceleration down an inclined plane 163 effects of gravity on motion of a projectile	25 investigate the effect of gravity 47 analyze the motion of a marble in 2 dimensions 49 investigate the range of a projectile 50 create and test a model to predict the landing spot of a projectile 60 investigate law of universal gravitation 60 calculate gravitational force of attraction

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				174	
					law of universal gravitation and orbital motion
				174	
					description of law of universal gravitation
				175	
					formula and calculations for law of universal gravitation
				176	
					orbits and gravitational force
				176	
					satellites and orbital motion
				176	
					orbital motion
				177	
					centripetal force and the law of universal gravitation combine to form the orbit equation
				177	
					satellite motion application
				178	
					HEO and geostationary orbit
				180	
					compare projectile motion to orbital motion
				180	
					calculate weight and acceleration due to gravity on Pluto
				187	
					the motion of a tossed object
				188	
					centers of mass and gravity may differ

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				209	
				work done against gravity	
				213	
				potential energy comes from gravity	
				238	
				tides are due to force of gravity	
				265	
				orbit is a type of cycle	
				642	
				Newton's laws and gravity	

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.III.03 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the motion of objects and waves, and the forces that cause them.	Know that materials containing equal amounts of positive and negative charges are electrically neutral, but that a small excess or deficit of negative charges produces significant electrical forces.	440	electric charge is a fundamental property of matter	170	investigate a triboelectric series
				441	electric forces are created between electric charges	171	investigate triboelectric charging
				442	explanation of coulomb	171	create an electrophorus
				442	electric charge is a property of the particles that make up the atom		
				443	current is the flow of charge		
				444	movement of electrons in current		
				444	negative charge of electrons and current flow		
				445	static electricity and charge polarization and induction		
				446	relationship of electric force and charge		
				447	the force between charges		
				448	charge creates an electric field		
				450	source charges and test charges		
				452	a capacitor stores charge		
				455	ability of a capacitor to store charge is capacitance		

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				463	
					comparing magnetic and electric forces
				464	
					force between two magnetics is not an inverse square law
				466	
					magnetism is a property of particles that make up the atom
				481	
					atomic currents
				502	
					electrons in a semiconductor
				522	
					smallest piece of matter is the atom
				588	
					charge and mass of electrons and protons and neutrons
				589	
					mass and the nucleus
				610	
					properties of subatomic particles

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.III.05 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the motion of objects and waves, and the forces that cause them.	Explain how electric currents cause magnetism and how changing magnetic fields produce electricity.	378	electricity and magnetism oscillations	186	build an electromagnet
				478	magnetic field of a wire	187	find out what happens to strength of electromagnet when current is increased
				479	force on a current in a magnetic field	187	what happens to the strength of an electromagnet when you increase the current?
				480	coils and solenoids		
				481	the magnetic field of coils and permanent magnets	193	investigate Faraday's law of induction
				483	calculate magnetic field at the center of a coil	193	investigate electromagnetic induction
				484	coils used in electromagnets		
				484	electromagnets		
				485	adding turns increases an electromagnet's strength		
				485	building an electromagnet		
				486	electric motor uses electromagnets to convert electrical energy to mechanical energy		
				487	how electromagnets are used in electric motors		
				489	concept of electromagnetic induction		
				490	magnetic flux		
				491	Faraday's law of induction		
				493	transformers operate on electromagnetic induction		

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				494	
				495	
				497	

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CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
II.I.III.06 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the motion of objects and waves, and the forces that cause them.	Represent the magnitude and direction of forces by vector diagrams.	141 adding vectors 142 adding vectors 143 adding and subtracting vectors 144 calculating vector components 145 finding magnitude and angle of a vector 147 the velocity vector 148 components of the velocity vector 149 adding velocity vectors 150 independence of horizontal and vertical motion in a velocity vector 152 calculating velocity components of initial velocity 154 interpreting the x-y components of force 154 the force vector describes the strength and direction of a force 155 calculating components of a force vector 158 calculate the acceleration of a skier on a slope	46 calculate the resultant vector 51 investigating force vectors 52 calculate force components 58 draw a free body diagram and label forces

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				208 work done by a force at an angle to the distance	

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CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.III.07 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the motion of objects and waves, and the forces that cause them.	Know that when one object exerts a force on a second object, the second object exerts a force of equal magnitude and in the opposite direction on the first object.	109	forces always occur in action-reaction pairs	32	investigate Newton's third law
				110	Newton's third law operates on pairs of objects	34	draw free body diagrams and identify action- reaction pairs
				111	solving problems with action-reaction forces	90	which ball had a greater change in momentum?
				111	identifying which force is acting on which object		
				124	the normal force as the reaction in an action- reaction pair		
				129	forces on a free-body diagram		
				133	understanding reaction forces in terms of springs and deformation		
				134	analysis of forces on a bridge		
				157	normal force of an inclined plane		
				246	momentum and Newton's third law		
				246	law of conservation of momentum		
				247	conservation of momentum in collisions		
				248	applying conservation of momentum		

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				249	
					momentum conservation for collisions in two and three dimensions
				253	
					conservation of angular momentum examples
				254	
					conservation of angular momentum
				257	
					jet engines work because of conservation of momentum
				392	
					Einstein's thinking about momentum of particles moving near the speed of light
				447	
					electric forces always occur in pairs according to Newton's third law
				570	
					Newton's third law and pressure in a fluid
				572	
					pressure and the third law
				579	
					pressure of gases
				629	
					conservation of momentum in nuclear reactions

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CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.III.08 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the motion of objects and waves, and the forces that cause them.	Apply Newton's Laws to describe and analyze the behavior of moving objects.	83	any acceleration must come from a force	27	collect data on Newton's first law
				100	changes in motion only occur through force	27	study Newton's first law
				101	all objects tend to resist changes in motion	28	explain how Newton's first law applies
				102	Newton's laws and cup holders	29	investigate Newton's second law
				103	Newton's second law of motion	32	investigate Newton's third law
				105	calculation using Newton's second law	34	draw free body diagrams and identify action- reaction pairs
				106	Newton's second law and dynamics problems		
				107	force problems		
				107	finding force from acceleration		
				107	if there is acceleration there must be force		
				109	forces always occur in action-reaction pairs		
				110	Newton's third law operates on pairs of objects		
				111	solving problems with action-reaction forces		
				111	identifying which force is acting on which object		

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				115	
				116	
				124	
				128	
				129	
				130	
				130	
				133	
				134	
				138	
				157	
				158	
				159	
				159	

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				170	
					direction of force determines linear or rotational motion
				171	
					calculating centripetal force
				172	
					formula for centripetal acceleration
				177	
					satellite motion application
				190	
					Newton's first law and rotational inertia
				191	
					Newton's second law applies to rotational motion
				193	
					Newton's second law for rotational motion variables
				244	
					Newton's first law and momentum
				246	
					momentum and Newton's third law
				250	
					Newton's second law relating force and momentum
				251	
					momentum form of Newton's second law
				262	
					forces in a car stopping
				274	
					Newton's second law and natural frequency

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				447 electric forces always occur in pairs according to Newton's third law	
				570 Newton's third law and pressure in a fluid	
				572 pressure and the third law	
				579 pressure of gases	

Correlation to New Mexico Science Content Standards, 9th - 12th grade

CPO Science Foundations of Physics, 2nd Ed.

Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
II.I.III.09 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the motion of objects and waves, and the forces that cause them.	Describe relative motion using frames of reference.	38 inertia is an effect of mass 61 speed is relative 83 any acceleration must come from a force 100 changes in motion only occur through force 101 descriptions of inertia and Newton's first law 101 all objects tend to resist changes in motion 103 Newton's second law of motion 106 Newton's second law and dynamics problems 107 if there is acceleration there must be force 107 finding force from acceleration 109 forces always come in pairs 109 forces always occur in action-reaction pairs 110 Newton's third law operates on pairs of objects 111 identifying which force is acting on which object	27 study Newton's first law 28 explain how Newton's first law applies 29 investigate Newton's second law 32 investigate Newton's third law 97 where is the mass that provides inertia? 147 when does special relativity become important? 148 relativity and frames of reference

Correlation to New Mexico Science Content Standards, 9th - 12th grade

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				115	
				problems using Newton's first law and second law	
				116	
				inertia problem	
				124	
				the normal force as the reaction in an action-reaction pair	
				128	
				Newton's second law and net force	
				130	
				equilibrium and Newton's second law	
				133	
				understanding reaction forces in terms of springs and deformation	
				149	
				calculating velocity vectors may require knowing frames of reference	
				159	
				the vector form of Newton's second law	
				170	
				direction of force determines linear or rotational motion	
				173	
				centrifugal force is actually an example of inertia	
				190	
				Newton's first law and rotational inertia	
				244	
				Newton's first law and momentum	

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				246	
					momentum and Newton's third law
				250	
					Newton's second law relating force and momentum
				271	
					inertia and restoring force cause harmonic motion
				336	
					Einstein's theory of relativity
				388	
					relationship between matter and energy and time and space
				388	
					special relativity and time dilation
				389	
					speed of light paradox
				389	
					relative motion and speed of light
				390	
					speed and time and clocks
				391	
					frequency of light depends on relative motion
				391	
					consequences of time dilation
				393	
					simultaneity depends on the relative motion of your frame of reference
				393	
					simultaneity depends on the relative motion of your frame of reference

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				447	
					electric forces always occur in pairs according to Newton's third law
				570	
					Newton's third law and pressure in a fluid
				572	
					pressure and the third law
				579	
					pressure of gases
				642	
					Einstein's theory and gravity and inertial mass
				642	
					inertial mass
				643	
					frame of reference and the equivalence principle
				644	
					general relativity and curved space-time
				645	
					black holes and general relativity

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.III.10 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the motion of objects and waves, and the forces that cause them.	Describe wave propagation using amplitude, wavelength, frequency, and speed.	264 266 267 271 273 280 282 286 286 287 288 288 289	what is a cycle? concepts of period and frequency explained concept of amplitude explained analyze the motion of the cycle of a pendulum systems tends to have a preferred frequency identify period and frequency and cycle and amplitude calculate speed of an oscillator frequency and amplitude and wavelength in waves basic properties of frequency and wavelength and amplitude concept of speed of a wave formula for speed of a wave speed of a wave is the speed at which a cycle moves transverse and longitudinal waves	93 101 102 103 103 104 106 107 107 144 145	investigate the motion of a pendulum if frequency is increased what happens to total energy? study characteristics of a wave pulse on a string measure speed of a wave pulse study the speed of the wave pulse is your water wave transverse or longitudinal? investigate frequency and wavelength investigate the wavelength of standing waves investigate the frequency of standing waves use a spectrometer to measure wavelength of different colors of light study the polarization of a transverse spring wave

Correlation to New Mexico Science Content Standards, 9th - 12th grade

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				290	
					creating plane waves and circular waves
				299	
					energy of a wave is proportional to frequency and amplitude
				300	
					modes of a wave
				300	
					wavelength of a standing wave
				301	
					modes of vibration
				304	
					describe relationship between wave characteristics
				305	
					type of wave represented by a spring
				308	
					sound waves require matter to traverse
				308	
					properties of sound waves
				309	
					frequency and pitch of sound
				310	
					relationship of loudness and amplitude and pressure in sound wave
				313	
					pressure and amplitude of sound waves
				314	
					importance of wavelength of sound waves
				314	
					sound is a longitudinal wave

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				314	
				frequency and wavelengths of sound	
				322	
				pitch and frequency in music	
				325	
				design of a guitar	
				330	
				wave amplitude and harmonics of tuning fork and musical instrument	
				332	
				light is a form of energy	
				334	
				the intensity of light	
				335	
				light carries information	
				336	
				the speed of light	
				350	
				how is light used for communication?	
				378	
				light can be described in terms of waves	
				379	
				relationship between frequency and energy and color of light	
				379	
				frequency and wavelength of light	
				380	
				speed of light is frequency multiplied by length	
				381	
				waves of the electromagnetic spectrum	
				395	
				wave fronts of light	

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				397	
					relate color to frequency for visible light
				474	
					MRI--each nucleus is a resonant oscillator
				552	
					electromagnetic radiation

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page		
II.I.III.11 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the motion of objects and waves, and the forces that cause them.	Explain how the interactions of waves can result in interference, reflection, and refraction.	292	waves and reflection	105	observing reflection in water waves
				292	waves and absorption	105	investigate reflection in a ripple tank
				292	waves and diffraction	105	investigate diffraction in a ripple tank
				292	waves and refraction	114	investigate interference with sound waves
				293	waves and reflection and boundaries	131	study how refraction works
				293	waves and refraction and boundaries	143	study light interference
				294	waves and absorption and boundaries	143	study light diffraction patterns
				294	waves and diffraction and boundaries		
				295	constructive and destructive interference		
				295	sound and light waves and interference		
				296	resonance and reflection		
				300	nodes and antinodes		
				317	standing wave patterns of sound		
				318	interference of sound waves		
				323	consonance and dissonance and beats		
				328	beats in a musical sound		
332	how we see						

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				337	
					light rays bounce off a surface
				337	
					light bends as it moves into a material
				339	
					how the human eye sees color
				340	
					how we perceive color
				341	
					we see mostly reflected light
				346	
					the process of how light is reflected
				346	
					the process of how light is reflected
				354	
					specular and diffuse reflection
				355	
					finding the normal line for reflection
				356	
					refraction is the bending of light rays
				358	
					total internal reflection and the critical angle
				361	
					the image formed in a mirror
				362	
					design of a lens
				367	
					diffraction spot size image defect

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				378	
					electromagnetic waves are oscillations of an energy field
				383	
					interference of light waves and Young's double-slit experiment
				384	
					diffraction grating
				395	
					holograms and the interference of light
				552	
					absorption of thermal radiation
				552	
					absorption of thermal radiation
				553	
					blackbody and perfect absorption of light
				596	
					absorption of light
				608	
					emission and absorption of photons in laser light

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Student Text and Investigation Manual

Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
II.I.III.12 The Content of Science	Physical Science: Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.	Understand the motion of objects and waves, and the forces that cause them.	Describe how waves are used for practical purposes.	284 waves are all around us 287 wave pulse 289 water waves are transverse and Slinky is longitudinal 290 one- and two- and three- dimensional waves 297 standing waves on a string 299 standing waves are used to store energy 299 standing waves on a string 301 vibration of a drum 308 sound is a wave of pressure 311 vibrations create sound 311 acoustics 313 how we know sound is a wave 316 effect of medium and temperature on speed of sound wave 317 designing a musical instrument 318 design of a good concert hall 320 sonograms 323 echolocation and beats	102 making wave pulses on a string 102 study wave pulses on elastic cord 104 making plane waves in a ripple tank 104 make different types of waves in a ripple tank 104 making circular waves in a ripple tank 109 investigate human perception of sound 140 study the thin lens formula 142 research medical and industrial uses of electromagnetic waves 142 study properties of the electromagnetic spectrum

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				324	musical instruments
				325	sound from a guitar
				328	list evidence that sound is a wave
				332	how we see
				333	fluorescent bulbs create UV light
				337	mirrors
				339	how the human eye sees color
				340	how we perceive color
				341	we see mostly reflected light
				342	visible light has just the right energy for life
				342	the energy of IR and UV light
				346	the process of how light is reflected
				353	mirrors reflect light
				353	lenses bend light
				354	the image in a mirror
				358	how fiber optics work
				360	how the human eye sees images
				368	thin lens formula

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Standard #: Strand	Standard	Benchmark	Performance Standard	Volume One Student Text Page	Volume Two Investigation Manual Page
				375	
				381	
				381	
				381	
				382	
				382	
				382	
				384	
				394	
				398	
				474	
				553	
				607	
				608	
				624	