

Physics A First Course, 2nd Edition

Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.1.1	Skills and Processes	4 what is an experiment	76 constraints for the thermal radiation demonstration model design
	The student will explain why curiosity, honesty, openness, and skepticism are highly regarded in science.	6 defining a system	121 goals and constraints for the maglev train design
		7 theories allow for predictions	
	The student will recognize that real problems have more than one solution and decisions to accept one solution over another are made on the basis of many issues.	22 unexpected discoveries	139 constraints for designing pendulum clock
		211 constraints on escalator design (#10)	
		236 constraints and materials to consider for the design of space gear	
1.1.2	Skills and Processes	9 scientific evidence and data tables	6 how does prediction compare with measurement?
	The student will explain why curiosity, honesty, openness, and skepticism are highly regarded in science.	10 what is a model	30 comparing predicted velocities to measured velocities
		196 the evidence supports the conclusion	
	The student will modify or affirm scientific ideas according to accumulated evidence.	244 draw a conclusion that supports the evidence	37 how did your measured acceleration compare with the prediction?
			64 investigate friction as a part of energy flow
1.1.3	Skills and Processes	103 analyzing a nutrition label	180 analyze industrial use of a type of electromagnetic wave
	The student will explain why curiosity, honesty, openness, and skepticism are highly regarded in science.	314 analyze an appliance label	
	The student will critique arguments that are based on faulty, misleading data or on the incomplete use of numbers.		
1.1.4			

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.1.4	Skills and Processes	9 scientific evidence and data tables	2 accuracy, resolution, and precision
	The student will explain why curiosity, honesty, openness, and skepticism are highly regarded in science.		7 find percent error
	The student will recognize data that are biased.		60 how close is your prediction to the actual measurement?
1.1.5	Skills and Processes	9 scientific evidence and data tables	30 comparing predicted velocities to measured velocities
	The student will explain why curiosity, honesty, openness, and skepticism are highly regarded in science.	16 significant digits and metric ruler	
		197 energy flow diagrams	
	The student will explain factors that produce biased data (incomplete data, using data inappropriately, conflicts of interest, etc.).		
1.2.1	Skills and Processes	8 hypothesis defined	0 Each investigation begins with a Key Question
	The student will pose scientific questions and suggest investigative approaches to provide answers to questions.	8 asking a scientific question	
	The student will identify meaningful, answerable scientific questions.		
1.2.2			

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.2.2	Skills and Processes	4 what is an experiment	0 Each investigation begins with a Key Question
	The student will pose scientific questions and suggest investigative approaches to provide answers to questions.	8 asking a scientific question	64 design an experiment
	The student will pose meaningful, answerable scientific questions.(NTB)		139 design pendulum experiments
1.2.3	Skills and Processes	8 formulating a hypothesis	4 formulate a hypothesis
	The student will pose scientific questions and suggest investigative approaches to provide answers to questions.	8 hypothesis defined	9 write a hypothesis
	The student will formulate a working hypothesis.		43 develop a hypothesis
			139 state a hypothesis about period of pendulum
			186 explain how your observations support or refute the hypothesis
1.2.4	Skills and Processes	8 formulating a hypothesis	4 formulate a hypothesis
	The student will pose scientific questions and suggest investigative approaches to provide answers to questions.		9 write a hypothesis
	The student will test a working hypothesis.(NTB)		43 develop a hypothesis
			139 state a hypothesis about period of pendulum
			186 explain how your observations support or refute the hypothesis
1.2.5			

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Standard	Description	Volume 1 Student Text		Volume 2 Investigation Manual	
1.2.5	Skills and Processes	11	measurement	126	selecting materials to use when building the generator
	The student will pose scientific questions and suggest investigative approaches to provide answers to questions.	12	metric system	162	selecting materials for creating a musical instrument
		13	measuring time		
	The student will select appropriate instruments and materials to conduct an investigation.				
1.2.6					

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.2.6	Skills and Processes		2 accuracy, resolution, and precision
	The student will pose scientific questions and suggest investigative approaches to provide answers to questions.		9 identify experimental and controlled variables
	The student will identify appropriate methods for conducting an investigation (independent and dependent variables, proper controls, repeat trials, appropriate sample size, etc.).		18 investigate mass and inertia
			21 investigate second law of motion
			23 investigate free fall
			38 investigate Hooke's law
			42 investigate sliding friction
			44 investigate projectile motion
			56 investigate changes in mechanical advantage
			62 investigate the efficiency of the car launcher
			82 investigate concepts of radioactivity
			108 investigate the nature of electric charge
			116 estimate the precision of measurements
			119 investigate how a steel pin affects magnetic force created by a coil
		125 investigate electromagnetic induction	
		139 investigate variables and how they affect the period of a pendulum	
		168 investigate the subtractive color model	
1.2.7			

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual	
1.2.7	Skills and Processes		67 which transportation method is the most efficient?	
	The student will pose scientific questions and suggest investigative approaches to provide answers to questions.		85 demonstrate two frames of reference	
	The student will use relationships discovered in the lab to explain phenomena observed outside the laboratory.		101 investigate short circuits and learn how to avoid	
			120 use the internet to research maglev trains	
1.2.8	Skills and Processes		6 how does prediction compare with measurement?	
	The student will pose scientific questions and suggest investigative approaches to provide answers to questions.		14 create and study a velocity vs. time graph	
	The student will defend the need for verifiable data.		22 create and analyze a second law of motion graph	
			37 how did your measured acceleration compare with the prediction?	
			58 force vs. distance data table	
			60 how close is your prediction to the actual measurement?	
1.3.1	Skills and Processes	13 measuring time	0 computer spreadsheets and graphing software can be used throughout the curriculum for data analysis and presentation	
	The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.	14 time scales in physics		1 using and understanding photogates
		27 practice measuring with a metric ruler		
		67 measuring weight vs. measuring mass		
	The student will develop and demonstrate skills in using lab and field equipment to perform investigative techniques.(NTB)	116 how spring scales work vs. truck scales		11 using a velocity sensor and data collection system
		222 thermometer scales		13 using a velocity sensor and data collection system
		301 using a multimeter to measure current		15 using photogates
		303 using a multimeter to measure resistance		21 use an electronic scale

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.3.2			51 use a spring scale
			54 use a spring scale
			58 use a spring scale
			61 using a timer and photogates
			63 using a timer and photogates
			74 use a temperature sensor and data collecton system
			93 use a multimeter
			95 use a multimeter to measure current
			96 use a multimeter to measure resistance of a pot
			97 use a multimeter to measure voltage drop
			100 use a multimeter to measure voltage
			101 use a multimeter to measure current
			110 use a multimeter to measure voltage
			125 use a timer and photogate to measure speed of rotor
			125 use a multimeter to measure voltage
	138 use a timer and photogate to measure the period of a pendulum		
	152 use a spring scale		

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.3.2	Skills and Processes	0 Safety Skill Builder packet found in Skill and Practice Worksheets on teacher resource CD	0 Lab Safety symbols and instructions are found in the investigation manual on the page before the TOC
	The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.		
	The student will recognize safe laboratory procedures.		
1.3.3	Skills and Processes	0 Safety Skill Builder packet found in Skill and Practice Worksheets on teacher resource CD	0 Lab Safety symbols and instructions are found in the investigation manual on the page before the TOC
	The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.		
	The student will demonstrate safe handling of the chemicals and materials of science.(NTB)		
1.3.4	Skills and Processes	67 measuring weight vs. measuring mass	11 using a velocity sensor and data collection system
	The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.	116 how spring scales work vs. truck scales	13 using a velocity sensor and data collection system
		222 thermometer scales	21 use an electronic scale
		51 use a spring scale	
	The student will learn the use of new instruments and equipment by following instructions in a manual or from oral direction.(NTB)		54 use a spring scale
			58 use a spring scale
			74 use a temperature sensor and data collection system
			152 use a spring scale
	1.4.1		

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
	Skills and Processes	9 scientific evidence and data tables	0 computer spreadsheets and graphing software can be used throughout the curriculum for data analysis and presentation
	The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.	19 mathematical descriptions	
		25 constructing a graph	6 create a graph of the car's speed vs. position
	The student will organize data appropriately using techniques such as tables, graphs, and webs	26 study the data table (#7)	12 analyze the graphical models
		26 interpreting distance/time graph	18 constant force data table
		28 make a data table (#6)	19 constant height data table
		36 mathematical model of acceleration	22 create and analyze a second law of motion graph
		38 motion graphs	39 create a graph of force vs. extension for the spring
		40 motion graphs	43 create a data table for all measurements
		51 create a data table (#1)	58 force vs. distance data table
		52 create a data table (#4)	59 graph work done vs. deflection of rubber band
		59 Newton's second law equation	60 graph speed vs. rubber band deflection
		65 average speed equation	62 make a graph of efficiency vs. speed
		67 calculating weight	83 construct a graph
		79 momentum equation	105 calculate power used by the bulb
		80 relating impulse and momentum conservation	111 graph current vs. time for the capacitor
		84 the work equation	111 derive a formula to calculate the charge
		86 kinetic energy formula	112 calculate the number of electrons
		108 using a graph to find force vector components	126 graph voltage vs. speed
		115 Hooke's law equation	139 sketch harmonic motion graphs
		141 projectile motion problems	
		143 calculating angular speed	
		144 finding the circumference of a circle	
		145 linear speed equation	

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.4.2		153 equation for law of universal gravitation	
		171 the power equation	
		178 calculating mechanical advantage	
		229 the heat equation	
		304 equation for Ohm's law	
		342 equation for Coulomb's law	
		431 harmonic motion graphs	
		432 finding the amplitude on a harmonic motion graph	
		452 calculating wave speeds	
		453 equation for the speed of a wave	
		547 equation for the speed of light	

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.4.2	Skills and Processes	7 theories allow for predictions	6 create a graph of the car's speed vs. position
	The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.	25 constructing a graph	6 predict the speed of the car
		38 motion graphs	12 analyze the graphical models
	The student will analyze data to make predictions, decisions, or draw conclusions.	40 motion graphs	19 how do your observations support your answer?
		62 you can predict that a downhill force must exist	22 create and analyze a second law of motion graph
		63 you can predict the velocity after it is dropped	29 testing your predictions
		81 the law of conservation of momentum allows us to make accurate predictions	37 predict the acceleration of the car on the ramp
		88 the law of conservation of energy can be used to predict the height of the ball	39 create a graph of force vs. extension for the spring
		108 using a graph to find force vector components	59 graph work done vs. deflection of rubber band
		158 predicting currents and eddies	60 graph speed vs. rubber band deflection
		196 the evidence supports the conclusion	60 predict speed of car
		244 draw a conclusion that supports the evidence	62 make a graph of efficiency vs. speed
		255 predicting the behavior of particles in a system	62 predict how many bounces the car will make
		280 Einstein's conclusion about the flow of time	64 analyze the results
		284 general relativity predicts black holes	64 construct a reasonable explanation
		305 use Ohm's law to predict the current	83 construct a graph
		431 harmonic motion graphs	94 propose a relationship between power and voltage
		432 finding the amplitude on a harmonic motion graph	111 graph current vs. time for the capacitor
			126 graph voltage vs. speed
			139 sketch harmonic motion graphs
1.4.3			

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.4.3	Skills and Processes		12 analyze the graphical models
	The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.		29 testing your predictions
	The student will use experimental data from various investigators to validate results.		121 compare and evaluate models
			133 use magnetic fields to solve a puzzle
1.4.4			

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Standard	Description	Volume 1 Student Text		Volume 2 Investigation Manual	
1.4.4	Skills and Processes	19	mathematical descriptions	111	derive a formula to calculate the charge
	The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.	26	interpreting distance/time graph	112	calculate the number of electrons
		36	mathematical model of acceleration	170	use results to derive law of reflection
	The student will determine the relationships between quantities and develop the mathematical model that describes these relationships.	59	Newton's second law equation		
		65	average speed equation		
		67	calculating weight		
		79	momentum equation		
		80	relating impulse and momentum conservation		
		84	the work equation		
		86	kinetic energy formula		
		115	Hooke's law equation		
		141	projectile motion problems		
		143	calculating angular speed		
		144	finding the circumference of a circle		
		145	linear speed equation		
		153	equation for law of universal gravitation		
		171	the power equation		
		178	calculating mechanical advantage		
		229	the heat equation		
		304	equation for Ohm's law		
	342	equation for Coulomb's law			
	452	calculating wave speeds			
	453	equation for the speed of a wave			
	547	equation for the speed of light			

1.4.5

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.4.5	Skills and Processes	38 position vs. time graphs	14 create and study a velocity vs. time graph
	The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.	39 position vs. time graph for accelerating motion	17 create and study a velocity vs. time graph
		40 speed vs. time graph	139 understanding graphs of harmonic motion
	The student will check graphs to determine that they do not misrepresent results.	41 speed vs. time graph for accelerating motion	
		43 finding distance from a speed vs. time graph	
	431 understanding graphs of harmonic motion		
1.4.6	Skills and Processes	4 what is analysis	12 analyze the graphical models
	The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.	8 cause and effect relationships	64 analyze the results
		26 study the data table (#7)	180 analyze industrial use of a type of electromagnetic wave
	The student will describe trends revealed by data.		
1.4.7	Skills and Processes	15 accuracy, precision, resolution	2 accuracy, resolution, and precision
	The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.		7 find percent error
		The student will determine the sources of error that limit the accuracy or precision of experimental results.	
1.4.8			

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual		
1.4.8	Skills and Processes	10 using models in science	0 computer spreadsheets and graphing software can be used throughout the curriculum for data analysis and presentation 13 create a model for the velocity of energy car 38 create and test a graphical model 76 evaluate the success of your heat transfer model 80 model how atoms exchange energy 120 making a model maglev train 121 compare and evaluate models 165 investigate the additive color model 168 investigate the subtractive color model		
	The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.	19 mathematical models			
		119 a model for friction			
	The student will use models and computer simulations to extend his/her understanding of scientific concepts. (NTB)	245 atomic structure models			
		253 quantum model of the atom			
	1.4.9	Skills and Processes			12 analyze the graphical models
		The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.			31 investigating momentum and the third law
					56 investigate changes in mechanical advantage
		The student will use analyzed data to confirm, modify, or reject a hypothesis.			62 investigate the efficiency of the car launcher
					71 investigate energy and phase changes
		72 investigating heat of fusion with water			
		77 investigate isotopes			
		101 investigate series circuits			
		186 explain how your observations support or refute the hypothesis			
1.5.1					

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual		
1.5.1	Skills and Processes	9 scientific evidence and data tables	0 each investigation contains a "thinking about what you observed" section, and students must be able to communicate and defend their findings from the investigation 18 constant force data table 19 constant height data table 43 create a data table for all measurements 58 force vs. distance data table 76 what is the best way to present your results? 180 present what you have learned		
	The student will use appropriate methods for communicating in writing and orally the processes and results of scientific investigation.	11 importance of units			
		11 communicating via measurement			
		26 study the data table (#7)			
	The student will demonstrate the ability to summarize data (measurements/observations).	28 make a data table (#6)			
		51 create a data table (#1)			
		52 create a data table (#4)			
	1.5.2	Skills and Processes		11 importance of units	0 each investigation contains a "thinking about what you observed" section, and students must be able to communicate and defend their findings from the investigation 64 create an energy flow diagram 76 what is the best way to present your results? 180 present what you have learned
		The student will use appropriate methods for communicating in writing and orally the processes and results of scientific investigation.		11 communicating via measurement	
28 prepare a written report (#3, 4, 8)					
213 prepare a written report (#1)					
The student will explain scientific concepts and processes through drawing, writing, and/or oral communication.		241 prepare a written report (#3, 5)			
		272 prepare a written report (#5)			
		359 research and report (#3)			
		463 research and report (#5)			
	542 research and report (#6)				
1.5.3					

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.5.3	<p data-bbox="384 272 632 293">Skills and Processes</p> <p data-bbox="384 321 842 435">The student will use appropriate methods for communicating in writing and orally the processes and results of scientific investigation.</p> <p data-bbox="384 451 842 597">The student will use computers and/or graphing calculators to produce the visual materials (tables, graphs, and spreadsheets) that will be used for communicating results.(NTB)</p>		<p data-bbox="1499 272 1976 386">0 computer spreadsheets and graphing software can be used throughout the curriculum for data analysis and presentation</p>
1.5.4			

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.5.4	Skills and Processes	9 scientific evidence and data tables	6 create a graph of the car's speed vs. position
	The student will use appropriate methods for communicating in writing and orally the processes and results of scientific investigation.	26 study the data table (#7)	14 create and study a velocity vs. time graph
		28 make a data table (#6)	17 create and study a velocity vs. time graph
	The student will use tables, graphs, and displays to support arguments and claims in both written and oral communication.	51 create a data table (#1)	18 constant force data table
		52 create a data table (#4)	19 constant height data table
			22 create and analyze a second law of motion graph
			38 create and test a graphical model
			43 create a data table for all measurements
			58 force vs. distance data table
			59 graph force vs. distance
			59 graph work done vs. deflection of rubber band
			62 make a graph of efficiency vs. speed
			64 create an energy flow diagram
			83 construct a graph
			126 graph voltage vs. speed
		139 sketch harmonic motion graphs	
		139 understanding graphs of harmonic motion	
		142 complex harmonic motion graphs	
1.5.5			

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Standard	Description	Volume 1 Student Text		Volume 2 Investigation Manual	
1.5.5	Skills and Processes	116	how spring scales work vs. truck scales	36	create a vector diagram
	The student will use appropriate methods for communicating in writing and orally the processes and results of scientific investigation.	158	predicting currents and eddies	64	create an energy flow diagram
		252	angles of incidence and refraction	139	sketch harmonic motion graphs
		364	magnetic fields	151	harmonics and standing wave patterns
	The student will create and/or interpret graphics. (scale drawings, photographs, digital images, field of view, etc.)	451	frequency and amplitude and wavelength of waves	179	using a spectrometer to identify elements
		511	plants and photosynthesis		
	523	drawing a ray diagram			
1.5.6	Skills and Processes	47	internet keyword search: whalenet	120	use the internet to research maglev trains
	The student will use appropriate methods for communicating in writing and orally the processes and results of scientific investigation.	213	research the use of solar cells	180	research electromagnetic waves
		333	research information about the production and sale of hybrid autos		
	The student will read a technical selection and interpret it appropriately.	359	research the use of capacitors (#6)		
		468	research the sweet spot baseball bat phenomenon		
		493	research what it means to have perfect pitch		
		535	research information on optical systems (#3)		
		559	research phenomenon associated with 3-D movie viewing (#1)		
1.5.7	Skills and Processes	118	static and sliding friction		
	The student will use appropriate methods for communicating in writing and orally the processes and results of scientific investigation.	179	simple machines and the human body		
		207	energy flow and food chains		
		456	how boundaries affect waves		
	The student will use, explain, and/or construct various classification systems.	471	the decibel scale		
		508	the CMYK color process		

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.5.8	Skills and Processes	23 science helps us learn about natural world	6 how does prediction compare with measurement?
	The student will use appropriate methods for communicating in writing and orally the processes and results of scientific investigation.		11 compare and contrast speed and velocity
	The student will describe similarities and differences when explaining concepts and/or principles.		37 how did your measured acceleration compare with the prediction?
			57 calculate and compare input and output work
			69 compare and contrast heat and temperature
			103 compare series and parallel circuits
			117 compare electromagnet and permanent magnet
			121 compare and evaluate models
1.5.9	Skills and Processes	8 cause and effect relationships	19 how do your observations support your answer?
	The student will use appropriate methods for communicating in writing and orally the processes and results of scientific investigation.	22 unexpected discoveries	64 construct a reasonable explanation
		23 science is a creative enterprise	94 propose a relationship between power and voltage
	The student will communicate conclusions derived through a synthesis of ideas.	196 the evidence supports the conclusion	
		244 draw a conclusion that supports the evidence	
		280 Einstein's conclusion about the flow of time	
1.6.1	Skills and Processes	38 slope of a position vs. time graph	7 find percent error
	The student will use mathematical processes.	42 slope of a speed vs. time graph	22 find the slope of the line and determine its significance in the experiment
	The student will use ratio and proportion in appropriate situations to solve problems.		83 find a percentage

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual	
1.6.2	Skills and Processes		0 computer spreadsheets and graphing software can be used throughout the curriculum for data analysis and presentation	
	The student will use mathematical processes.		11 using a velocity sensor and data collection system	
	The student will use computers and/or graphing calculators to perform calculations for tables, graphs, or spreadsheets.(NTB)		13 using a velocity sensor and data collection system	
			74 use a temperature sensor and data collecton system	
1.6.3	Skills and Processes	12 metric system	88 speed and time dilation	
	The student will use mathematical processes.	17 speed of light	164 speed of light	
	The student will express and/or compare small and large quantities using scientific notation and relative order of magnitude.	471 the decibel scale		
		498 speed of light		
		547 equation for the speed of light		
1.6.4				

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.6.4	Skills and Processes	19 mathematical descriptions	3 speed defined and calculated
	The student will use mathematical processes.	26 interpreting distance/time graph	62 calculate efficiency of the experimental system
		36 mathematical model of acceleration	64 calculate energy
	The student will manipulate quantities and/or numerical values in algebraic equations.	59 Newton's second law equation	66 calculate each person's power
		65 average speed equation	66 calculate each person's work
		67 calculating weight	105 calculate power used by the bulb
		79 momentum equation	107 calculate energy and power
		80 relating impulse and momentum conservation	111 derive a formula to calculate the charge
		84 the work equation	112 calculate the number of electrons
		86 kinetic energy formula	
		115 Hooke's law equation	
		141 projectile motion problems	
		143 calculating angular speed	
		144 finding the circumference of a circle	
		145 linear speed equation	
		153 equation for law of universal gravitation	
		171 the power equation	
		178 calculating mechanical advantage	
		229 the heat equation	
		304 equation for Ohm's law	
		342 equation for Coulomb's law	
		452 calculating wave speeds	
		453 equation for the speed of a wave	
	547 equation for the speed of light		

1.6.5

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Standard	Description	Volume 1 Student Text		Volume 2 Investigation Manual	
1.6.5	Skills and Processes	25	constructing a graph	6	create a graph of the car's speed vs. position
	The student will use mathematical processes.	38	motion graphs	12	analyze the graphical models
	The student will judge the reasonableness of an answer.	40	motion graphs	22	create and analyze a second law of motion graph
		108	using a graph to find force vector components	39	create a graph of force vs. extension for the spring
		431	harmonic motion graphs	59	graph work done vs. deflection of rubber band
		432	finding the amplitude on a harmonic motion graph	60	graph speed vs. rubber band deflection
				62	make a graph of efficiency vs. speed
				80	energy and quantum theory
				83	construct a graph
				111	graph current vs. time for the capacitor
				126	graph voltage vs. speed
				139	sketch harmonic motion graphs
	1.7.1	Skills and Processes	23	impact of medical breakthroughs	132
The student will show that connections exist both within the various fields of science and among science and other disciplines including mathematics, social studies, language arts, fine arts, and technology.		120	maglev train technology	166	connection to life science: photoreceptors in the eye
The student will apply the skills, processes, and concepts of biology, chemistry, physics, or earth science to societal issues.				168	research how computer monitors and televisions make colors
1.7.2					

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Standard	Description	Volume 1 Student Text		Volume 2 Investigation Manual	
1.7.2	Skills and Processes	120	maglev train technology	168	research how computer monitors and televisions make colors
	The student will show that connections exist both within the various fields of science and among science and other disciplines including mathematics, social studies, language arts, fine arts, and technology.	273	how a smoke detector works		
		474	recording sound		
		554	applications of polarization		
	The student will identify and evaluate the impact of scientific ideas and/or advancements in technology on society.				
1.7.3	Skills and Processes	22	unexpected discoveries		
	The student will show that connections exist both within the various fields of science and among science and other disciplines including mathematics, social studies, language arts, fine arts, and technology.	23	science is a creative enterprise		
		488	Musician		
	The student will describe the role of science in the development of literature, art, and music.(NTB)				
1.7.4					

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
1.7.4	Skills and Processes	10 using models in science	22 find the slope of the line and determine its significance in the experiment
	The student will show that connections exist both within the various fields of science and among science and other disciplines including mathematics, social studies, language arts, fine arts, and technology.	19 mathematical models	38 create and test a graphical model
		19 mathematical descriptions	84 investigate frames of reference
		36 mathematical model of acceleration	86 consider that time passes at different rates in reference frames that are moving relative to each other
		119 a model for friction	94 propose a relationship between power and voltage
		245 atomic structure models	111 derive a formula to calculate the charge
	The student will recognize mathematics as an integral part of the scientific process.(NTB)	253 quantum model of the atom	117 find relationship between current and magnetic field
1.7.5	Skills and Processes	22 bacteriologist	
	The student will show that connections exist both within the various fields of science and among science and other disciplines including mathematics, social studies, language arts, fine arts, and technology.	96 forensic engineer	
		126 science, engineering, and architecture	
		132 civil engineer (# 3)	
		209 tidal power is an active area of engineering research	
		277 physicists have built special experiments to capture and study neutrinos	
	The student will investigate career possibilities in the various areas of science.(NTB)	287 a challenge for physicists	
		332 automobile engineer and hybrid cars	
	559 geophysicists		
1.7.6			

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Standard	Description	Volume 1 Student Text		Volume 2 Investigation Manual	
1.7.6	Skills and Processes	22	unexpected discoveries	168	research how computer monitors and televisions make colors
	The student will show that connections exist both within the various fields of science and among science and other disciplines including mathematics, social studies, language arts, fine arts, and technology.	120	maglev train technology	180	analyze industrial use of a type of electromagnetic wave
		277	physicists have built special experiments to capture and study neutrinos	180	research electromagnetic waves
	The student will explain how development of scientific knowledge leads to the creation of new technology and how technological advances allow for additional scientific accomplishments.	449	waves and technology		
		512	improvements made possible by charge-coupled devices		
		537	improving retinal implants		
		548	low-energy electromagnetic waves		
		549	high-energy electromagnetic waves		

5.1.1

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
5.1.1	Concepts of Physics	4 what is analysis	2 accuracy, resolution, and precision
	The student will know and apply the laws of mechanics to explain the behavior of the physical world.	115 Hooke's law	7 find percent error
		196 the evidence supports the conclusion	19 how do your observations support your answer?
	The student will use analytical techniques appropriate to the study of physics.	244 draw a conclusion that supports the evidence	49 find the average range of the launched marble
		280 Einstein's conclusion about the flow of time	60 how close is your prediction to the actual measurement?
			64 analyze the results
			64 construct a reasonable explanation
			81 spectral analysis and electron energy levels
			94 propose a relationship between power and voltage
			107 find the average of the three times
			178 stars and spectroscopy
			179 using a spectrometer to identify elements
			180 analyzing light from different sources
			181 analyzing light from a star
5.1.2			

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
5.1.2	Concepts of Physics	17 constant speed	16 collect data to calculate the car's acceleration
	The student will know and apply the laws of mechanics to explain the behavior of the physical world.	37 acceleration and velocity	31 investigate momentum
		54 force defined	34 working with force vectors
	The student will use algebraic and geometric concepts to qualitatively and quantitatively describe an object's motion.	56 units of force	36 resolve a force into component vectors and solve for the unknown force
		79 calculating momentum	
		107 force vectors	
		108 resolving vectors	
		109 using a free-body diagram	
		112 finding resultant vector	
		136 working with velocity vector	
		147 centripetal force	
	148 centripetal force		
5.1.3	Concepts of Physics	55 Newton's first law	18 investigate Newton's first law of motion
	The student will know and apply the laws of mechanics to explain the behavior of the physical world.	59 Newton's second law	20 second law of motion
		59 quantitative understanding of second law	21 Newton's second law and the Atwood's machine
	The student will analyze and explain how Newton's Laws describe changes in an object's motion.	60 applying Newton's second law properly	21 investigate second law of motion
		61 using second law formula	25 investigate Newton's 3rd law
		77 Newton's third law	31 investigate Newton's 3rd law of motion
		78 sorting out force pairs	35 using Newton's second law
		114 Newton's third law and springs	
		126 the third law and physics of walls	
	436 Newton's second law and oscillators		
5.1.4			

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Standard	Description	Volume 1 Student Text		Volume 2 Investigation Manual	
5.1.4	Concepts of Physics	57	net force explained	18	investigate Newton's first law of motion
	The student will know and apply the laws of mechanics to explain the behavior of the physical world.	60	balanced and unbalanced forces	21	Newton's second law and the Atwood's machine
		61	net force and second law calculating	25	investigate Newton's 3rd law
	The student will analyze the behavior of forces.	113	when net force is zero	31	investigate Newton's 3rd law of motion
		115	Hooke's law	34	working with force vectors
		179	simple machines and the human body	38	investigate Hooke's law
				58	measure the force
				59	graph force vs. distance
				115	investigate the strength of magnetic force
				116	use a compass to investigate magnetic forces
			119	investigate how a steel pin affects magnetic force created by a coil	
5.1.5	Concepts of Physics	10	conservation of energy	27	conservation of energy and the pendulum
	The student will know and apply the laws of mechanics to explain the behavior of the physical world.	81	law of conservation of momentum	64	draw an energy flow diagram
		82	using momentum conservation to solve problems	80	model how atoms exchange energy
	The student will analyze systems with regard to the conservation laws.	92	momentum and collisions		
		95	momentum and car safety		
	197	energy conservation and closed systems			
5.2.1					

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Standard	Description	Volume 1 Student Text		Volume 2 Investigation Manual	
5.2.1	Concepts of Physics	340	understanding electric charge	108	investigate the nature of electric charge
	The student will know and apply the laws of electricity and magnetism and explain their significant role in nature and technology.	341	charged objects and static electricity	132	understand and investigate electric and gravitational fields
		342	electric forces are very strong		
		354	understanding lightning		
	The student will describe the types of electric charges and the forces that exist between them.	414	the electric field		
5.2.2	Concepts of Physics	362	what is a magnet	115	investigate the strength of magnetic force
	The student will know and apply the laws of electricity and magnetism and explain their significant role in nature and technology.	364	magnetic fields	117	compare electromagnet and permanent magnet
		365	magnetic field lines		
		366	right-hand rule	117	find relationship between current and magnetic field
	The student will describe the sources and effects of electric and magnetic fields.	376	magnets and MRI scanners	119	investigate how a steel pin affects magnetic force created by a coil
		385	magnetic field of a wire		
		386	using coils to concentrate a magnetic field	131	investigate magnetic fields
		414	the electric field	132	understand and investigate electric and gravitational fields
			133	use magnetic fields to solve a puzzle	
5.2.3	Concepts of Physics	366	electromagnets	117	find relationship between current and magnetic field
	The student will know and apply the laws of electricity and magnetism and explain their significant role in nature and technology.	367	building an electromagnet	119	investigate how a steel pin affects magnetic force created by a coil
		391	electromagnetic induction explained		
	The student will qualitatively describe the applications of electromagnetic induction.			125	investigate electromagnetic induction
5.3.1					

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual		
5.3.1	Concepts of Physics	201	efficiency of a heat engine		
	The student will recognize and relate the laws of thermodynamics to practical applications.				
	The student will relate thermodynamics to the balance of energy in a system.				
5.4.1	Concepts of Physics	448	waves transmit energy	149	study water waves
	The student will explain and demonstrate how vibrations and waves provide a model for our understanding of various physical phenomena.	454	standing waves on a vibrating string	180	analyze industrial use of a type of electromagnetic wave
		461	waves and energy	181	relating transverse waves on a spring to light waves
	The student will compare qualitatively how waves are propagated and transmit energy.				
5.4.2	Concepts of Physics	431	understanding graphs of harmonic motion	139	understanding graphs of harmonic motion
	The student will explain and demonstrate how vibrations and waves provide a model for our understanding of various physical phenomena.	451	frequency and amplitude and wavelength of waves	150	investigate standing waves and frequency
		452	the speed of waves	151	multiply frequency and wavelength of standing wave to find the speed
	The student will describe wave characteristics using both diagrams and calculations.	471	the decibel scale		
		472	speed of sound		
		477	wavelength of sound		
		484	pitch and the musical scale		
5.4.3					

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Standard	Description	Volume 1 Student Text	Volume 2 Investigation Manual
5.4.3	Concepts of Physics	428 sound is a wave	142 complex harmonic motion graphs
	The student will explain and demonstrate how vibrations and waves provide a model for our understanding of various physical phenomena.	433 circular motion and phase	150 investigate standing waves and frequency
		434 harmonic motion that is out of phase	150 investigate standing waves
	The student will qualitatively describe the physical behaviors of waves.	437 period and natural frequency	151 multiply frequency and wavelength of standing wave to find the speed
		438 resonance explained	151 harmonics and standing wave patterns
		451 frequency and amplitude and wavelength of waves	154 properties of sound waves
		452 the speed of waves	155 investigate sound wave interference
		456 reflected waves	182 explore polarization of light
		456 refracted waves	183 explore the concept of polarization of light
		456 how boundaries affect waves	
		457 diffraction explained	
		457 absorption explained	
		458 the superposition principle	
		460 natural frequency and resonance	
		470 sound is a wave	
		470 superposition principle and complex sound	
		472 speed of sound	
		474 how sound is recorded	
		475 sound is a wave	
		477 wavelength of sound	
		479 standing waves and resonance	
		484 pitch and the musical scale	
		487 harmonics and instruments	
	553 polarization		

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Standard	Description	Volume 1 Student Text		Volume 2 Investigation Manual	
5.5.1	Concepts of Physics	252	quantum theory explained	80	relate idea that electrons exist at set energy levels to quantum theory
	The student will investigate certain topics in modern physics.	253	quantum model of the atom	186	
	The student will cite evidence of the wave/particle duality in the nature of matter.	505	photons		quantum theory of light
		555	photon theory of light		
5.5.2	Concepts of Physics	256	nuclear reactions explained		
	The student will investigate certain topics in modern physics.	257	nuclear reactions and energy		
	The student will qualitatively explain the processes associated with nuclear energy and its applications.	258	fusion reactions		
		259	fission reactions		