

Correlation to Arizona Science Standards

Physics: A First Course

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
1SC-P1.PO1 Science as Inquiry	Proficiency	Propose solutions to practical and theoretical problems by synthesizing and evaluating information gained from scientific investigations	Evaluate scientific information for relevance to a given problem	8 asking a scientific question 72 energy usage and conservation	6 do results agree with hypothesis?

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
1SC-P1.PO2 Science as Inquiry	Proficiency	Propose solutions to practical and theoretical problems by synthesizing and evaluating information gained from scientific investigations	Propose solutions to a problem, based on information gained from scientific investigations		<p>6 do results agree with hypothesis?</p> <p>6 predict fastest car</p> <p>6 do results agree with hypothesis?</p> <p>6 reflecting on the experiment</p> <p>7 construct explanations supported by evidence</p> <p>9 how do your observations support your answer?</p> <p>11 what experimental data support answer?</p> <p>15 predict speed of car</p> <p>21 predict speed of car</p> <p>30 predict temperature of mixture</p> <p>45 predict how many bounces the car will make</p> <p>47 construct a reasonable explanation</p> <p>60 propose a relationship between power and voltage</p> <p>67 explain what happened</p> <p>96 make predictions about natural frequency</p>

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1SC-P2.PO1 Science as Inquiry	Proficiency	Compare observations of the real world to observations of a constructed model (e.g., an aquarium, a terrarium, a volcano)	Assess the capability of a model to represent a "real world" scenario	10 what is a model 16 constructing graphs 16 steps to follow for graph construction 19 mathematical models 19 mathematical descriptions 25 constructing a graph 26 interpreting distance/time graph 34 mathematical model of acceleration 35 Newton's second law equation 41 average speed equation 43 calculating weight 46 motion graphs 48 motion graphs 61 momentum equation 62 relating impulse and momentum conservation 68 kinetic energy formula 86 the work equation 89 the power equation 96 calculating mechanical advantage 112 using a graph to find force vector components	4 construct a graph 11 find formula for acceleration 11 create a graph 13 derive a formula 15 graph speed vs. height 17 derive a formula to use with ropes and pulleys 17 calculate mechanical advantage 20 graph work done vs. deflection of rubber band 21 graph speed vs. rubber band deflection 25 graph friction vs. mass 27 graph launch angle vs. range 29 calculate the ratio 29 find a mathematical name for the steepness ratio 29 graph acceleration vs. steepness ratio 31 calculate temperature of mixture 45 make a graph of efficiency vs. speed 50 graph time vs. temperature

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				118	Hooke's law equation	52	construct a graph
				141	projectile motion problems	69	calculate power used by the bulb
				143	calculating angular speed	75	graph current vs. time for the capacitor
				144	finding the circumference of a circle	75	derive a formula to calculate the charge
				145	linear speed equation	76	calculate the number of electrons
				153	equation for law of universal gravitation	86	graph voltage vs. speed
				179	the heat equation	94	sketch harmonic motion graphs
				193	density formula	99	calculate natural frequency and period
				208	pressure and temperature relationship	154	calculate gear ratio
				308	equation for Ohm's law		
				342	equation for Coulomb's law		
				419	harmonic motion graphs		
				420	finding the amplitude on a harmonic motion graph		
				438	calculating wave speeds		
				439	equation for the speed of a wave		
				525	equation for the speed of light		

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
1SC-P3.PO1 Science as Inquiry	Proficiency	Analyze and evaluate reports of scientific studies	Analyze reports of scientific studies for elements of experimental design	6 what is a variable 8 control and experimental variables 8 dependent variables 8 independent variables 8 scientific method 16 graphs and dependent variables 16 graphs and independent variables 22 scientific method in action 24 importance of changing one variable at a time in an experiment	6 recognize and control variables 6 design a better experiment 13 design other experiments 15 design another experiment 27 identify and control variables 94 investigate variables and how they affect the period of a pendulum

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
1SC-P3.PO2 Science as Inquiry	Proficiency	Analyze and evaluate reports of scientific studies	Compare conclusions to original hypotheses		<p>6 do results agree with hypothesis?</p> <p>6 reflecting on the experiment</p> <p>7 construct explanations supported by evidence</p> <p>9 how do your observations support your answer?</p> <p>11 what experimental data support answer?</p> <p>31 did result agree with hypothesis?</p> <p>47 construct a reasonable explanation</p> <p>60 propose a relationship between power and voltage</p>

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
1SC-P3.PO3 Science as Inquiry	Proficiency	Analyze and evaluate reports of scientific studies	Evaluate validity of conclusions		<p>4 use photogate A to monitor repeatability</p> <p>6 reflecting on the experiment</p> <p>7 construct explanations supported by evidence</p> <p>9 how do your observations support your answer?</p> <p>11 what experimental data support answer?</p> <p>27 practice your technique until it is repeatable</p> <p>47 construct a reasonable explanation</p> <p>52 find a percentage</p> <p>60 propose a relationship between power and voltage</p>
1SC-P4.PO1 Science as Inquiry	Proficiency	Create and defend a written plan of action for a scientific investigation	Design an appropriate protocol (written plan of action) for the investigation of a scientific problem	<p>4 what is an experiment</p> <p>8 designing experiments</p>	<p>6 design a better experiment</p> <p>13 design other experiments</p> <p>15 design another experiment</p> <p>47 design an experiment</p> <p>94 design pendulum experiments</p>

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
1SC-P4.PO2 Science as Inquiry	Proficiency	Create and defend a written plan of action for a scientific investigation	Justify the protocol in terms of the elements of experimental design	4 6 8 8 8 8 8 16 16 22 24	6 6 15 21 27 30 45 47 94 94 96 154
				what is an experiment what is a variable designing experiments control and experimental variables dependent variables independent variables scientific method graphs and dependent variables graphs and independent variables scientific method in action importance of changing one variable at a time in an experiment	recognize and control variables predict fastest car predict speed of car predict speed of car identify and control variables predict temperature of mixture predict how many bounces the car will make design an experiment design pendulum experiments investigate variables and how they affect the period of a pendulum make predictions about natural frequency create a report

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
1SC-P5.PO1 Science as Inquiry	Proficiency	Apply the concepts of equilibrium, form and function to a variety of phenomena	Predict the effects of various factors on the equilibrium of a system	7 the scale of a system 9 changes in scale of systems 9 energy in a system 9 stability of systems 14 time scales 114 systems in equilibrium 128 equilibrium and architecture 423 restoring forces and equilibrium 423 equilibrium and harmonic motion	6 predict fastest car 15 predict speed of car 21 predict speed of car 22 investigate equilibrium 30 predict temperature of mixture 31 did result agree with hypothesis? 45 predict how many bounces the car will make 96 make predictions about natural frequency
1SC-P5.PO2 Science as Inquiry	Proficiency	Apply the concepts of equilibrium, form and function to a variety of phenomena	Explain how the relationships between form and function are evident in natural and design systems	23 science helps us learn about natural world 105 engineering design cycle in action	
1SC-P5.PO3 Science as Inquiry	Proficiency	Apply the concepts of equilibrium, form and function to a variety of phenomena	Describe how present form and function of an object, organism or system could have evolved from prior form and function	6 parts of a car and ramp system 10 an example system	

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page		Volume Two Investigation Manual Page	
1SC-P6.PO1 Science as Inquiry	Proficiency	Identify and refine a researchable question, conduct the experiment, collect and analyze data, share and discuss findings	Construct a researchable question	4	what is an experiment	47	design an experiment
				8	hypothesis defined	94	design pendulum experiments
				8	designing experiments		
				8	asking a scientific question		
1SC-P6.PO2 Science as Inquiry	Proficiency	Identify and refine a researchable question, conduct the experiment, collect and analyze data, share and discuss findings	Employ a research design that incorporates a scientific method to carry out an experiment	8	scientific method	6	form a hypothesis
				8	formulating a hypothesis	6	design a better experiment
				22	scientific method in action	13	design other experiments
						15	design another experiment
						30	state a hypothesis about the water's energy
						94	state a hypothesis about period of pendulum
						96	state a hypothesis about the natural frequency of the oscillator

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
1SC-P6.PO3 Science as Inquiry	Proficiency	Identify and refine a researchable question, conduct the experiment, collect and analyze data, share and discuss findings	Analyze experimental data	4 56 what is analysis analyze a speed/distance graph	3 4 21 26 27 47 71 154 car launching technique is a possible source of error car launching technique is a possible source of error how close is your prediction to the actual measurement? spotting the landing point of the marble is tricky marble launching technique is a possible source of error analyze the results find the average of the three times analyze gear ratio data

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
1SC-P6.PO4 Science as Inquiry	Proficiency	Identify and refine a researchable question, conduct the experiment, collect and analyze data, share and discuss findings	Communicate experimental findings to others	11 importance of units 11 communicating via measurement	6 reflecting on the experiment 7 construct explanations supported by evidence 9 how do your observations support your answer? 11 what experimental data support answer? 47 construct a reasonable explanation 52 find a percentage 60 propose a relationship between power and voltage 154 create a report

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
2SC-P1.PO1 History and Nature of Science	Proficiency	Identify and describe key factors (e.g., technology, competitiveness, world events, personalities, societal views) that affect the development and acceptance of scientific thought	Define key factors that affect the development of scientific thought	19 mathematical models 22 discovery of Penicillin 22 Fleming's investigations 23 science helps us learn about natural world 53 relationship between science and technology 78 rocket technology 79 new technologies 213 deep water submarine technology 235 technology and archaeology 273 how a smoke detector works 458 recording sound 532 applications of polarization	
2SC-P1.PO2 History and Nature of Science	Proficiency	Identify and describe key factors (e.g., technology, competitiveness, world events, personalities, societal views) that affect the development and acceptance of scientific thought	Describe how different key factors affect the development and acceptance of scientific thought	19 mathematical models 104 prosthetic legs and technology 122 maglev train technology	112 research how computer monitors and televisions make colros 161 making a model maglev train

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
2SC-P2.PO1 History and Nature of Science	Proficiency	Explain how scientific innovations can challenge accepted ideas	Describe how an accepted idea could be challenged by scientific innovation	53 relationship between science and technology 78 rocket technology 79 new technologies 167 history of atomic theory 213 deep water submarine technology 218 atomic theory 219 development of atom models 235 technology and archaeology 273 how a smoke detector works 458 recording sound 532 applications of polarization	4 use photogate A to monitor repeatability 27 practice your technique until it is repeatable

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
2SC-P3.PO1 History and Nature of Science	Proficiency	Explain the impact on society of major scientific developments (e.g., germ theory, molecular biology, relativity)	Describe the benefits, limitations, and consequences of major scientific, developments in pure and applied science	167 history of atomic theory 218 atomic theory 219 development of atom models 247 burning gasoline and low efficiency 247 sources of electrical power in the United States 254 generating electricity from the ocean's energy 255 energy in the ocean 267 nuclear reactions explained 268 nuclear reactions and energy	157 research electricity generation methods
2SC-P3.PO2 History and Nature of Science	Proficiency	Explain the impact on society of major scientific developments (e.g., germ theory, molecular biology, relativity)	Explain how major scientific developments in pure and applied science have affected, or could affect, society	8 cause and effect relationships 23 impact of medical breakthroughs 104 prosthetic legs and technology 122 maglev train technology	112 research how computer monitors and televisions make colros 161 making a model maglev train

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
2SC-P4.PO1 History and Nature of Science	Proficiency	Trace the development and consequences of an invention, theory or discovery to demonstrate the dynamic nature of science	Trace the development of a selected invention, theory or discovery from its inception to modern day	22 22 167 218 219 224	discovery of Penicillin Fleming's investigations history of atomic theory atomic theory development of atom models development of periodic table
2SC-P4.PO2 History and Nature of Science	Proficiency	Trace the development and consequences of an invention, theory or discovery to demonstrate the dynamic nature of science	Explain the progression of changes in the invention, theory or discovery	22 22 167 167 218 218 219 219 224	discovery of Penicillin Fleming's investigations history of atomic theory history of atomic theory atomic theory atomic theory development of atom models development of atom models development of periodic table

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2SC-P4.PO3 History and Nature of Science	Proficiency	Trace the development and consequences of an invention, theory or discovery to demonstrate the dynamic nature of science	Describe the impact of the invention, theory or discovery on further scientific thought	11 11 22 22 23 284	importance of units communicating via measurement discovery of Penicillin Fleming's investigations impact of medical breakthroughs theory of special relativity	53 55	explore the concept of relativity a thought experiment on Einstein's theories
2SC-P5.PO1 History and Nature of Science	Proficiency	Explain how theory, law and fact are developed in science to answer a specific question	Define theory, law and fact	8 22	scientific method scientific method in action	4 27	use photogate A to monitor repeatability practice your technique until it is repeatable

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2SC-P5.PO2 History and Nature of Science	Proficiency	Explain how theory, law and fact are developed in science to answer a specific question	Describe the relationships among theories, laws and fact	8 scientific method 22 scientific method in action	4 use photogate A to monitor repeatability 6 reflecting on the experiment 7 construct explanations supported by evidence 9 how do your observations support your answer? 11 what experimental data support answer? 27 practice your technique until it is repeatable 47 construct a reasonable explanation 60 propose a relationship between power and voltage
2SC-P5.PO3 History and Nature of Science	Proficiency	Explain how theory, law and fact are developed in science to answer a specific question	Explain how theories, laws and facts are used to answer specific questions	8 asking a scientific question	4 use photogate A to monitor repeatability 27 practice your technique until it is repeatable

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2SC-P6.PO1 History and Nature of Science	Proficiency	Analyze evidence that supports past and current scientific theories about a specific topic	Distinguish between evidence which supports a given scientific theory (e.g., model of the atom, plate tectonics, natural selection) and evidence which does not support the theory	23	science helps us learn about natural world	6 reflecting on the experiment 7 construct explanations supported by evidence 9 how do your observations support your answer? 11 what experimental data support answer? 47 construct a reasonable explanation 60 propose a relationship between power and voltage
3SC-P1.PO1 Personal and Social Perspectives in Science and Technology	Proficiency	Apply scientific thought processes and procedures to personal and social issues	Apply scientific thought processes of skepticism, empiricism, objectivity and logic seek a solution to personal and social issues	8 8 20 22 104 122	scientific method hypothesis defined problem solving scientific method in action prosthetic legs and technology maglev train technology	112 research how computer monitors and televisions make colros 161 making a model maglev train
3SC-P1.PO2 Personal and Social Perspectives in Science and Technology	Proficiency	Apply scientific thought processes and procedures to personal and social issues	Apply a scientific method to the solution of personal and social issues	53 105 129 186 234 515	science and photography science and biomechanics science and architecture materials scientists archaeologists recording images	87 measure voltage for each different generator

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3SC-P2.PO1 Personal and Social Perspectives in Science and Technology	Proficiency	Propose and test, using computer software or common materials, a solution to an existing problem; or design a product to meet a need, using a model or simulation	Describe a problem or need	8 8 105	hypothesis defined asking a scientific question engineering design cycle in action		
3SC-P2.PO2 Personal and Social Perspectives in Science and Technology	Proficiency	Propose and test, using computer software or common materials, a solution to an existing problem; or design a product to meet a need, using a model or simulation	Propose a solution to the problem or design a product to meet the need	22 23 105 186	unexpected discoveries science is a creative enterprise engineering design cycle in action creativity and discoveries of Charles Goodyear	6 87	do results agree with hypothesis? building different generators

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3SC-P2.PO3 Personal and Social Perspectives in Science and Technology	Proficiency	Propose and test, using computer software or common materials, a solution to an existing problem; or design a product to meet a need, using a model or simulation	Design a method of testing the solution or design a model or simulation to test the product	4 8 10 105	<ul style="list-style-type: none"> what is an experiment designing experiments what is a model engineering design cycle in action <ul style="list-style-type: none"> 6 reflecting on the experiment 7 construct explanations supported by evidence 9 how do your observations support your answer? 11 what experimental data support answer? 47 conduct the experiment you designed 47 design an experiment 47 construct a reasonable explanation 60 propose a relationship between power and voltage 87 measure voltage for each different generator 87 building different generators 87 building different generators 94 design pendulum experiments

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3SC-P2.PO4 Personal and Social Perspectives in Science and Technology	Proficiency	Propose and test, using computer software or common materials, a solution to an existing problem; or design a product to meet a need, using a model or simulation	Carry out the test of the solution or product	11 12 13 105	measurement metric system measuring time engineering design cycle in action	61 87 87	collect and record resistance data building different generators building different generators
3SC-P2.PO5 Personal and Social Perspectives in Science and Technology	Proficiency	Propose and test, using computer software or common materials, a solution to an existing problem; or design a product to meet a need, using a model or simulation	Evaluate the test results	10 105	what is a model engineering design cycle in action	47 52 87 87	suggest a design modification find a percentage building different generators measure voltage for each different generator

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3SC-P3.PO1 Personal and Social Perspectives in Science and Technology	Proficiency	Compare and contrast the goals of science and technology	Define the goals of science and the goals of technology	53	relationship between science and technology	112	research how computer monitors and televisions make colors
				78	rocket technology		
				79	new technologies	161	making a model maglev train
				104	prosthetic legs and technology		
				122	maglev train technology		
				213	deep water submarine technology		
				235	technology and archaeology		
				273	how a smoke detector works		
				458	recording sound		
				532	applications of polarization		

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3SC-P3.PO2 Personal and Social Perspectives in Science and Technology	Proficiency	Compare and contrast the goals of science and technology	Compare the goals of science and the goals of technology	53 relationship between science and technology 78 rocket technology 79 new technologies 104 prosthetic legs and technology 122 maglev train technology 213 deep water submarine technology 235 technology and archaeology 273 how a smoke detector works 458 recording sound 532 applications of polarization	112 research how computer monitors and televisions make colros 161 making a model maglev train

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3SC-P3.PO3 Personal and Social Perspectives in Science and Technology	Proficiency	Compare and contrast the goals of science and technology	Describe the impact of technology on the life, physical, earth and space sciences	53 relationship between science and technology 78 rocket technology 79 new technologies 213 deep water submarine technology 221 weak force explained 222 radioactive decay 235 technology and archaeology 270 radioactive materials 273 how a smoke detector works 435 waves and technology 458 recording sound 532 applications of polarization	

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5SC-P3.PO1 Physical Science	Proficiency	Identify, measure, calculate, and analyze qualitative and quantitative relationships associated with energy forms and energy transfer or transformation (e.g., changes in temperature, velocity, potential energy, kinetic energy, conduction, convection, ect)	Identify qualitative and quantitative relationships associated with energy (e.g., heat, mechanical, electrical)	9 241	33 investigate energy and phase changes 34 apply concept of energy and phase changes 47 identify forms of energy in an experimental system
5SC-P3.PO2 Physical Science	Proficiency	Identify, measure, calculate, and analyze qualitative and quantitative relationships associated with energy forms and energy transfer or transformation (e.g., changes in temperature, velocity, potential energy, kinetic energy, conduction, convection, ect)	Measure quantitative (e.g., heat, mechanical, electrical) relationships associated with energy	68 70 117 170 170 175 178 249	30 measure final temperature 31 measure final temperature 32 investiate concept of specific heat 33 measure final temperature 48 measure temperature 49 measure temperature 50 measure temperature

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5SC-P3.PO3 Physical Science	Proficiency	Identify, measure, calculate, and analyze qualitative and quantitative relationships associated with energy forms and energy transfer or transformation (e.g., changes in temperature, velocity, potential energy, kinetic energy, conduction, convection, ect)	Calculate quantitative relationships associated with energy (e.g., heat mechanical, electrical)	15 setting up unit conversions 94 work and simple machines 101 output work is always less than input work 172 kinetic theory and temperature 177 calories explained 178 specific heat explained 179 the heat equation 280 meaning of Einstein's formula 308 Ohm's law 321 Ohm's law and voltage drops 328 calculating power in a circuit	18 compare and contrast input and output work 32 investiate concept of specific heat 33 investigate energy and phase changes 34 apply concept of energy and phase changes 61 collect and record resistance data 62 investigate Ohm's law 63 use Ohm's law 64 investigating voltage drops 67 Ohm's law and short circuits 69 finding power used by a circuit 70 explain what you observed in terms of energy and power 71 calculate energy and power 75 work with Ohm's law

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5SC-P5.PO3 Physical Science	Proficiency	Describe and predict chemical reactions (including combustion and simple chemical reactions) and physical interaction of matter (including velocity, force, work and power), using words or symbolic equations	Describe physical interactions through use of word equations or formulae	9	basic forms of energy	6	how can speed be measured?
				17	speed of light	11	compare and contrast speed and acceleration
				17	speed defined	11	find acceleration of car
				18	calculating speed	12	investigate momentum
				32	acceleration of sports cars	13	calculate momentum of two cars
				33	calculating acceleration	13	analyze collision data
				35	quantitative understanding of second law	18	calculate work
				36	applying Newton's second law properly	18	investigate concept of work
				37	using second law formula	20	graph force vs. distance
				40	acceleration of falling objects	25	apply Newton's second law of motion
				45	terminal speed	25	calculate acceleration of car
				45	skydiving and terminal speed	28	calculate acceleration
				61	calculating momentum	28	investigate acceleration on a ramp
				66	calculating work done on objects	29	apply Newton's second law of motion
				66	work defined	47	identify forms of energy in an experimental system
				86	calculating work	154	identify force and distance trade-off
				87	work results from force and distance that are in same distance		
				88	work done by or against gravity		

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				89	
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				143	
				149	
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				245	
				250	
				252	
				254	
				254	

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5SC-P5.PO4 Physical Science	Proficiency	Describe and predict chemical reactions (including combustion and simple chemical reactions) and physical interaction of matter (including velocity, force, work and power), using words or symbolic equations	Predict the results of a physical interaction by using an algebraic formula	19	mathematical descriptions	6	predict fastest car
				26	interpreting distance/time graph	11	find formula for acceleration
				34	mathematical model of acceleration	13	derive a formula
				35	Newton's second law equation	15	predict speed of car
				41	average speed equation	17	derive a formula to use with ropes and pulleys
				43	calculating weight	17	calculate mechanical advantage
				61	momentum equation	21	predict speed of car
				62	relating impulse and momentum conservation	29	calculate the ratio
				68	kinetic energy formula	29	find a mathematical name for the steepness ratio
				86	the work equation	30	predict temperature of mixture
				89	the power equation	31	calculate temperature of mixture
				96	calculating mechanical advantage	45	predict how many bounces the car will make
				118	Hooke's law equation	69	calculate power used by the bulb
				141	projectile motion problems	75	derive a formula to calculate the charge
				143	calculating angular speed	76	calculate the number of electrons
				144	finding the circumference of a circle	96	make predictions about natural frequency
				145	linear speed equation	99	calculate natural frequency and period
				153	equation for law of universal gravitation		
				179	the heat equation		
				193	density formula		

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				208 pressure and temperature relationship	154 calculate gear ratio
				308 equation for Ohm's law	
				342 equation for Coulomb's law	
				438 calculating wave speeds	
				439 equation for the speed of a wave	
				525 equation for the speed of light	

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5SC-P6.PO1 Physical Science	Proficiency	Describe and explain physical interactions of matter and energy, using conceptual models (e.g., particle model for gaseous behavior)	Demonstrate the use of conceptual models in science (e.g., formulae, diagrams, graphs)	10 what is a model 16 constructing graphs 16 steps to follow for graph construction 25 constructing a graph 46 motion graphs 48 motion graphs 112 using a graph to find force vector components 419 harmonic motion graphs 420 finding the amplitude on a harmonic motion graph	4 construct a graph 11 create a graph 15 graph speed vs. height 20 graph work done vs. deflection of rubber band 21 graph speed vs. rubber band deflection 25 graph friction vs. mass 27 graph launch angle vs. range 29 graph acceleration vs. steepness ratio 45 make a graph of efficiency vs. speed 50 graph time vs. temperature 52 construct a graph 75 graph current vs. time for the capacitor 86 graph voltage vs. speed 94 sketch harmonic motion graphs

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
5SC-P6.PO2 Physical Science	Proficiency	Describe and explain physical interactions of matter and energy, using conceptual models (e.g., particle model for gaseous behavior)	Describe physical interactions of matter and energy (e.g., phase change, gas laws, momentum conservation)	5 matter vs. energy 5 energy defined 9 energy and its forms 10 conservation of energy 63 law of conservation of momentum 64 using momentum conservation to solve problems 65 energy defined 67 potential energy explained 68 kinetic energy explained 70 law of conservation of energy 71 using energy conservation to solve problems 74 momentum and collisions 77 momentum and car safety 174 phase changes 207 Boyle's law and the behavior of gases 209 importance of Charles' law 249 energy flow diagram for mechanical systems	13 apply the law of conservation of momentum 14 investigate exchange of energy in car and track system 15 apply law of energy conservation 42 model how atoms exchange energy 47 draw an energy flow diagram

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
5SC-P6.PO3 Physical Science	Proficiency	Describe and explain physical interactions of matter and energy, using conceptual models (e.g., particle model for gaseous behavior)	Justify the validity of known conceptual models applied to physical phenomena	28 force defined 31 net force explained 32 acceleration defined 33 acceleration and velocity 35 Newton's second law 37 net force and second law calculating 52 action-reaction pairs 59 Newton's third law 60 sorting out force pairs 66 energy is stored work 78 third law and rockets 111 force vectors 113 using a free-body diagram 115 finding resultant vector 116 when net force is zero 117 Newton's third law and springs 128 the third law and physics of walls 158 Newton's third law and helicopters 424 Newton's second law and oscillators	10 investigate Newton's second law of motion 11 investigate net force 12 investigate Newton's 3rd law of motion 13 relate Newton's 3rd law of motion to car collisions 19 investigate concept of energy as stored work 22 when net force is zero 23 draw a free body diagram 23 use force vectors 23 Newton's second law of motion 95 Newton's 2nd law of motion and natural frequency

Correlation to Arizona Science Standards

Physics: A First Course

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page		Volume Two Investigation Manual Page	
5SC-P7.PO1 Physical Science	Proficiency	Demonstrate the understanding of gravitation as a universal force that each mass exerts on any other mass	Use the universal law of gravitation to predict how the gravity force changes with a change of distance and/or mass	31	net force explained	11	investigate net force
				35	quantitative understanding of second law	22	when net force is zero
				36	applying Newton's second law properly	25	apply Newton's second law of motion
				37	using second law formula	29	apply Newton's second law of motion
				37	net force and second law calculating		
				116	when net force is zero		
				153	Newton's law of universal gravitation explained		

Correlation to Arizona Science Standards

Physics: A First Course

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5SC-P8.PO1 Physical Science	Proficiency	Demonstrate qualitative understanding of the 1st Law of Thermodynamics (conservation of matter and energy) and the 2nd Law of Thermodynamics (entropy)	Use the 1st Law of Thermodynamics to explain the energy changes in a physical system	10 conservation of energy 67 potential energy explained 67 calculating potential energy 68 kinetic energy explained 68 potential to kinetic energy conversions 68 calculating kinetic energy 69 kinetic energy and stopping distance of a car 70 law of conservation of energy 70 potential to kinetic energy conversions 71 using energy conservation to solve problems 117 potential and kinetic energy in a spring 173 phases of matter 174 phase changes 249 energy flow diagram for mechanical systems 249 mechanical systems and energy 334 efficiency of electric motors	14 investigate exchange of energy in car and track system 15 apply law of energy conservation 15 calculate potential energy of car 24 calculate kinetic energy of sled 34 arrangement of solid, liquid, gas particles 35 comparing equal masses of gas, solid, and liquid 36 solid, liquid, gas density differences 42 model how atoms exchange energy 45 graph efficiency vs. speed 45 investigate efficiency 47 draw an energy flow diagram 47 calculate energy 48 investigate energy changes in chemical reactions

Correlation to Arizona Science Standards

Physics: A First Course

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Standard #: Standard	Level	Concept	Performance Objective	Volume One Student Text Page	Volume Two Investigation Manual Page
				334 efficiency of gasoline engine	
5SC-P8.PO2 Physical Science	Proficiency	Demonstrate qualitative understanding of the 1st Law of Thermodynamics (conservation of matter and energy) and the 2nd Law of Thermodynamics (entropy)	Describe a sequence of events that illustrates the 2nd Law of Thermodynamics	86 calculating work 88 calculating work 94 work and simple machines 101 output work is always less than input work 102 efficiency explained 246 efficiency explained 247 efficiency of a heat engine 248 efficiency of living things 334 efficiency of electric motors 334 efficiency of gasoline engine	18 compare and contrast input and output work 45 graph efficiency vs. speed 45 investigate efficiency 45 calculate efficiency of the experimental system