

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	3	inquiry starts with questions	12	was this experiment better or worse than the first?
				11	acceptance of the Copernican model of the solar system on the basis of scientific evidence	89	what is it that moves in the case of a wave?
				44	checking a graphical model's accuracy	97	reliability of a double-blind test
				103	evaluating perpetual motion claims	97	did the method give an accurate result?

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	7	revising explanations through observation	16	what do the results tell you?
				8	refining theories based on observations	18	are the accelerations different?
				10	the usefulness of phlogiston theory despite being incorrect	19	does the ball accelerate?
				71	parachutes and air resistance	43	what would happen if...?
				113	conceptual design for a bridge	58	explain why the angular acceleration is different
				306	explain why hearing can be damaged by loud sounds	80	explain your observations
						87	explain how force applied causes the response
						90	explain why higher tension makes waves move faster
						92	explain how wind might cause big waves in water
						109	explain how the colored filters work
						132	what conclusions can you draw?
						133	analyze data and explain a rule
						163	propose solutions that will work for each disk
						204	build models of Na and Cl and use them to explain bonding

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	7	developing models to explain observations	13	create a graph
				11	Ptolemy model vs. Copernicus model of the solar system	13	compare prediction to measurement
				40	creating useful models	16	describe the graph
				40	making a good model	16	create a graph
				43	constructing a graph	22	create graphs
				44	using a graphical model to make a prediction and checking the model's accuracy	22	compare calculation with graph estimate
				44	graphical models	22	how do you measured positions compare to model?
				54	constructing a graph	22	uniform acceleration model
				55	create a graph from a data table	22	model for uniform accelerated motion
				60	creating the acceleration formula from experiments	24	create an algebraic model
				66	developing the formulas for a model of motion with constant acceleration	28	solve second law equation for string tension
				101	a model for friction	29	does experiment agree with prediction?
				102	a model for static friction	32	develop a model that predicts acceleration
				282	write a formula relating velocity of wave to period and wavelength	37	make a graph
				290	the process of digital sound reproduction	38	make a graph
				297	frequency spectrum	43	how does the measurement compare to your prediction?
						43	create algebraic model

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

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				312	light intensity follows an inverse square law	43	sketch four graphs
				330	optics and optical instruments	49	write a formula
				411	the waveform of AC electricity	56	create a graph
				492	the binary number system and its use in computers	66	create a graph of speed vs. position
						76	compare predicted mass to actual mass
						82	make three different graphs
						87	sketch a graph
						94	give an equation that describes your observations
						114	are there differences between your prediction and measurement?
						135	graph voltage vs. current
						136	graph voltage vs. current
						151	make a graph of voltage vs. time
						160	create a graph
						167	make a graph of voltage vs. number of magnets
						169	make a current vs. voltage graph for the diode
						189	Bernoulli's equation

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
1SC-P3.PO1 Science as Inquiry	Proficiency	Analyze and evaluate reports of scientific studies	Analyze reports of scientific studies for elements of experimental design	40	defining variables	11	recognizing and controlling variables
				42	control and experimental variables	43	follow the scientific method
				43	dependent and independent variables in graphs	82	determine which variable has the greatest effect
				54	importance of changing one variable at a time in an experiment	82	dependent and independent variables
				251	changing the natural frequency of a stretched rubber band	166	variables that affect the performance of the generator
						201	determine the equipment you will need

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
1SC-P3.PO2 Science as Inquiry	Proficiency	Analyze and evaluate reports of scientific studies	Compare conclusions to original hypotheses	7	revising explanations through observation	12	do your results agree with hypothesis?
				8	refining theories based on observations	16	what do the results tell you?
				188	perpetual motion machines	18	are the accelerations different?
				306	explain why hearing can be damaged by loud sounds	19	does the ball accelerate?
						33	does your experiment confirm your hypothesis?
						43	what would happen if...?
						50	does your experiment provide confirmation?
						58	explain why the angular acceleration is different
						66	does this agree with your hypothesis?
						80	explain your observations
						87	explain how force applied causes the response
						90	explain why higher tension makes waves move faster
						92	explain how wind might cause big waves in water
						109	explain how the colored filters work
						132	what conclusions can you draw?

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
						133	analyze data and explain a rule
1SC-P3.PO3 Science as Inquiry	Proficiency	Analyze and evaluate reports of scientific studies	Evaluate validity of conclusions	11	acceptance of the Copernican model of the solar system on the basis of scientific evidence	12	was this experiment better or worse than the first?
				44	checking a graphical model's accuracy	97	reliability of a double-blind test
				103	evaluating perpetual motion claims	97	did the method give an accurate result?
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	42	writing lab procedures	43	write a procedure
				242	finding a basic cycle of harmonic motion	43	perform experiment
				432	making a simple capacitor	65	investigate motion on a roller coaster
				456	an experiment with a wire and compass	67	investigate motion on a roller coaster
				463	building an electromagnet with wire and a nail	82	design an experiment
				467	experiment demonstrating electromagnetic induction	201	develop a procedure
						201	design a procedure to separate a mixture
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	9	testing ideas against scientific evidence	43	follow the scientific method
						82	plan three experiments to determine which variable affects the period of a pendulum

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	7 498	creating theories based on observations since wood is created from other matter it must not be a fundamental substance	13 18 33 37 38 42 65 132	predict speed of ball how would acceleration be different? calculate the predicted speed use your graph to make a prediction use your graph to make a prediction predict exact landing location predict where the ball moves fastest predict what the current will be
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	541	form and the strength of materials		
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	541	form and the strength of materials		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	3	using life experiences and common sense	82	design an experiment
				3	inquiry starts with questions	89	what is it that moves in the case of a wave?
				432	making a simple capacitor	201	design a procedure to separate a mixture
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	formulating a hypothesis	11	formulate a testable hypothesis
				9	testing ideas against scientific evidence	21	plan the experiment
				42	writing lab procedures	33	formulate a testable hypothesis
						43	follow the scientific method
						43	write a procedure
						48	formulate a hypothesis
						65	form a hypothesis
						79	write a hypothesis
						82	plan three experiments to determine which variable affects the period of a pendulum
						201	develop a procedure
						201	determine the equipment you will need

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	25 412	why accuracy and precision are important average voltage and current of AC power	13 25 58 63 66 67 71 82 133 202	is there a trend in measurements? find the average time find average of three trials as mechanical advantage increases what happens to length of pulled string? what does the graph tell you? calculate average of three times calculate average work and power analyze data did battery voltage change? identify two sources of experimental error
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	24 42 43	making graphs of experimental results over time writing procedures in a lab notebook helps make sure your results are repeatable constructing a graph	43 122 122 175 202	create four graphs communicate your findings present your findings display information you found for your element keep detailed notes as you work

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	7 40 101 102 330 492 641	developing models to explain observations creating useful models a model for friction a model for static friction optics and optical instruments the binary number system and its use in computers research on future of the universe	22	model for uniform accelerated motion
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	7 40 101 102 330 492 641	developing models to explain observations creating useful models a model for friction a model for static friction optics and optical instruments the binary number system and its use in computers research on future of the universe	22	model for uniform accelerated motion

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	62 188 292 372 499 576	acceleration of cars perpetual motion machines sound in space holograms and science fiction special effects development of atomic theory transporter beams	75	the discovery of atom's nucleus

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	31	nanotechnology application	75	the discovery of atom's nucleus
				73	use of control computers in cars	143	the cost of using electrical appliances
				197	efficiency of the Hoover Dam	168	electronic devices are part of our daily lives
				217	advantages of tidal energy		
				392	environmental impact of auto pollution		
				499	development of atomic theory		
				546	physical properties of plastics		
				573	nuclear reactions		
				614	Marie Curie		
				615	Henri Bequerel and beta rays		
				621	human technology contributes to radiation in environment		
				625	nuclear reactions		
				628	nuclear waste		
631	nuclear power application						

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	52 91 92 112	Dr. Harold Edgerton and strobe photography biomechanics application applications of biomechanics impact of technology		
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	499 614 615	development of atomic theory Marie Curie Henri Bequerel and beta rays	75	the discovery of atom's nucleus
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	499 614 615	development of atomic theory Marie Curie Henri Bequerel and beta rays	75	the discovery of atom's nucleus

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	52 91 92 614 615 641	Dr. Harold Edgerton and strobe photography biomechanics application applications of biomechanics Marie Curie Henri Bequerel and beta rays research on future of the universe		
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	136 367 369 375	determining formula for acceleration on a ramp speed of light did not behave as expected for Michelson and Morley proof of time dilation explain Thomas Young's demonstration of the wave nature of light	43 111	follow the scientific method how does what you observed support the quantum theory?

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	Comparing a theory and a natural law	16	what do the results tell you?
				8	testing hypotheses with experiments	18	are the accelerations different?
				136	determining formula for acceleration on a ramp	19	does the ball accelerate?
				306	explain why hearing can be damaged by loud sounds	43	what would happen if...?
				367	speed of light did not behave as expected for Michelson and Morley	58	explain why the angular acceleration is different
				369	proof of time dilation	80	explain your observations
				375	explain Thomas Young's demonstration of the wave nature of light	87	explain how force applied causes the response
						90	explain why higher tension makes waves move faster
						92	explain how wind might cause big waves in water
						109	explain how the colored filters work
						111	how does what you observed support the quantum theory?
						132	what conclusions can you draw?
						133	analyze data and explain a rule

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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 8 136 367 369 375	Comparing a theory and a natural law testing hypotheses with experiments determining formula for acceleration on a ramp speed of light did not behave as expected for Michelson and Morley proof of time dilation explain Thomas Young's demonstration of the wave nature of light	111	how does what you observed support the quantum theory?

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	7	in science inquiry is used to uncover truth	16	what do the results tell you?
				306	explain why hearing can be damaged by loud sounds	18	are the accelerations different?
				560	deep water submarine Alvin application	19	does the ball accelerate?
				644	proof of Einstein's theory of general relativity	43	what would happen if...?
				645	astronomers find black holes by what is around them	58	explain why the angular acceleration is different
						80	explain your observations
						87	explain how force applied causes the response
						90	explain why higher tension makes waves move faster
						92	explain how wind might cause big waves in water
						109	explain how the colored filters work
						132	what conclusions can you draw?
						133	analyze data and explain a rule

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	12	engineers design practical devices for solving problems		
				15	physics plays a role in nearly everything a person does		
				31	use of nanotechnology		
				62	acceleration of cars		
				72	antilock brakes application		
				112	designing a bridge		
				138	use of robots		
				155	geostationary satellites		
				188	perpetual motion machines		
				196	hydroelectric power application		
				209	range of power for common devices		
				216	energy from ocean tides		
				217	research into tidal power		
				228	seat belts and air bags		
				235	jet engines application		
				257	quartz crystals application		
				280	microwave ovens application		
				292	sound in space		
				293	uses of Doppler radar		

Correlation to Arizona Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				296	ultrasound technology		
				311	invention of electric light		
				325	the printing press		
				349	the telescope		
				372	holograms and science fiction special effects		
				378	importance of electricity		
				392	hybrid gas/electric cars application		
				413	wiring application		
				434	how television works application		
				451	MRI application		
				490	why computers are useful		
				534	energy-efficient building application		
				576	transporter beams		
				623	creation of CAT scans		
				631	nuclear power application		
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	62	acceleration of cars		
				188	perpetual motion machines		
				292	sound in space		
				372	holograms and science fiction special effects		
				576	transporter beams		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	113 113 543	the engineering design cycle conceptual design for a bridge failure analysis in the design process	163 163 173	apply steps of the design cycle to building different electric motors propose solutions that will work for each disk designing and building logic circuits
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	113	conceptual design for a bridge	163	propose solutions that will work for each disk
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	113	build and test a prototype structure out of toothpicks	83 85 163 191	design and construct a pendulum create a system that oscillates design and test different electric motors build an air-speed tester

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	113	build and test a prototype structure out of toothpicks	83 85 163 191	design and construct a pendulum create a system that oscillates design and test different electric motors build an air-speed tester
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	113 113 389 543	build and test a prototype structure out of toothpicks test and evaluate the prototype structure design electrical devices are designed to operate at a certain voltage evaluate three designs for a bridge	83 85 163 164 167 191	design and construct a pendulum create a system that oscillates design and test different electric motors evaluate the performance of motor designs suggest improvements you could make to the generator design build an air-speed tester

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	12	engineers design practical devices for solving problems		
				12	all technology is based on fundamental laws of physics		
				31	use of nanotechnology		
				31	use of nanotechnology		
				51	analyzing motion with video and strobe photography		
				72	antilock brakes application		
				72	antilock brakes application		
				112	designing a bridge		
				112	relationship between science and engineering and technology		
				138	use of robots		
				155	geostationary satellites		
				172	bicycle physics application		
				196	hydroelectric power application		
				196	hydroelectric power application		
				209	range of power for common devices		
216	energy from ocean tides						

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				217	research into tidal power		
				228	seat belts and air bags		
				235	jet engines application		
				235	jet engines application		
				243	oscillators are used in communications and music and clocks		
				257	quartz crystals application		
				257	quartz crystals application		
				263	waves can carry information		
				280	microwave ovens application		
				280	microwave ovens application		
				293	uses of Doppler radar		
				311	invention of electric light		
				325	the printing press		
				325	the printing press		
				349	the telescope		
				369	technological advances have allowed discovery of the expanding universe		
				372	holography application		
				378	importance of electricity		
				392	hybrid gas/electric cars application		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				392	hybrid gas/electric cars application		
				413	wiring application		
				413	wiring application		
				429	electron beam accelerators		
				434	how television works application		
				434	how television works application		
				451	MRI application		
				451	MRI application		
				472	maglev train application		
				473	how magplanes levitate		
				490	why computers are useful		
				492	computers and electronic addition of numbers application		
				516	refrigerator application		
				534	energy-efficient building application		
				534	energy-efficient building application		
				560	deep water submarine Alvin application		
				585	laser application		
				615	smoke detectors		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				623	creation of CAT scans		
				623	creation of CAT scans		
				631	nuclear power application		
				631	nuclear power application		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

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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	12	engineers design practical devices for solving problems		
				12	all technology is based on fundamental laws of physics		
				31	use of nanotechnology		
				31	use of nanotechnology		
				51	analyzing motion with video and strobe photography		
				72	antilock brakes application		
				72	antilock brakes application		
				112	designing a bridge		
				112	relationship between science and engineering and technology		
				138	use of robots		
				155	geostationary satellites		
				172	bicycle physics application		
				196	hydroelectric power application		
				196	hydroelectric power application		
				209	range of power for common devices		
216	energy from ocean tides						

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				217	research into tidal power		
				228	seat belts and air bags		
				235	jet engines application		
				235	jet engines application		
				243	oscillators are used in communications and music and clocks		
				257	quartz crystals application		
				257	quartz crystals application		
				263	waves can carry information		
				280	microwave ovens application		
				280	microwave ovens application		
				293	uses of Doppler radar		
				311	invention of electric light		
				325	the printing press		
				325	the printing press		
				349	the telescope		
				369	technological advances have allowed discovery of the expanding universe		
				372	holography application		
				378	importance of electricity		
				392	hybrid gas/electric cars application		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				392	hybrid gas/electric cars application		
				413	wiring application		
				413	wiring application		
				429	electron beam accelerators		
				434	how television works application		
				434	how television works application		
				451	MRI application		
				451	MRI application		
				472	maglev train application		
				473	how magplanes levitate		
				490	why computers are useful		
				492	computers and electronic addition of numbers application		
				516	refrigerator application		
				534	energy-efficient building application		
				534	energy-efficient building application		
				560	deep water submarine Alvin application		
				585	laser application		
				615	smoke detectors		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				623	creation of CAT scans		
				623	creation of CAT scans		
				631	nuclear power application		
				631	nuclear power application		
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	392	environmental impact of auto pollution		
				502	elements past #92 are radioactive and decay		
				570	use of radioactive isotopes in medicine		
				570	radioactive isotopes		
				604	balancing chemical equation of acid rain		
				614	radioactive decay		
				616	energy and radioactivity		
				621	human technology contributes to radiation in environment		
				622	x-ray machines		
				623	CAT scans		
				628	nuclear waste		
				632	nuclear energy		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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)	189	energy appears in different forms		
				190	different forms of energy		
				212	understand basic forms of energy		
				310	light is a form of energy		
				322	photons are bundles of light energy		
				378	electrical energy		
				384	batteries use chemical energy		
				509	heat of fusion		
				510	heat of vaporization		
				511	evaporation and condensation		
				552	explanation of pressure and energy		
				606	energy from sunlight stored through photosynthesis		
				619	radiation as a flow of energy		
				622	energy of x-rays		
				647	energy from antimatter		

Correlation to Arizona Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	194	energy transformations	72	potential to kinetic energy conversion in a pendulum
				196	energy transformation hydroelectric plant	88	potential to kinetic energy conversions of a pendulum
				199	kinetic and potential energy conversions while bouncing in a trampoline	176	investigate temperature and its effect on materials
				212	energy flow in a pendulum	179	specific heat
				245	kinetic to potential energy changes in motion of an oscillator		
				253	oscillators exchange energy back and forth between potential and kinetic		
				504	temperature scales and Fahrenheit-Celsius conversions		
				505	measuring temperature		
				507	the Kelvin scale and converting between Kelvin and Celsius		
				514	specific heat and the heat equation		
				519	understanding Fahrenheit and Celsius and Kelvin		
				533	using Kelvin for radiation calculations		
				558	using temperature in Kelvins for Charles' law		

Correlation to Arizona Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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)	191	calculate the potential energy of a cart		
				192	calculating kinetic energy depends on speed and mass		
				193	calculate the kinetic energy of a moving car		
				197	calculating energy supplied by Hoover Dam		
				207	power is the rate of doing work or using energy		
				208	units of power		
				209	calculating power for common devices		
				211	estimate average input power of a person		
				216	estimating the energy in tides		
				220	calculate energy and power for humans		
				513	definition of calorie		
				514	the heat equation		
				517	air conditioners		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	36	the precise meaning of speed	9	calculate speed of rolling marble
				37	calculating speed	17	find the acceleration
				38	the speed formula and calculating speed	25	derive acceleration equation
				41	speed of a ball on a ramp	29	calculate the acceleration
				46	speed is the rate of change of position	63	studying the concept of work
				47	average and instantaneous speed	70	calculate work
				60	calculating acceleration from experiments	70	calculate person's power
				64	calculate speed in accelerated motion	71	calculate work done
				64	calculate speed in accelerated motion	71	calculate power output for each climber
				67	calculate time and distance from acceleration	73	calculating momentum
				70	calculating height and time of flight in free fall problems	75	investigate collisions and conservation of momentum
				74	understanding average speed and instantaneous speed	77	the momentum form of Newton's second law
				83	calculation using Newton's second law	77	relationship between force and motion and the second law
				85	force problems		
				103	calculate the acceleration of a car including friction		
108	use equilibrium to find an unknown force						

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				116	calculate the acceleration of a toy		
				129	analyze a horizontally launched projectile		
				136	calculating acceleration on a ramp		
				137	calculating acceleration from 3-D forces		
				142	calculating acceleration for sled on slope		
				149	calculating centripetal force		
				150	formula for centripetal acceleration		
				150	calculate the centripetal acceleration of a motorcycle		
				169	Newton's second law applies to rotational motion		
				171	Newton's second law for rotational motion variables		
				185	physics definition of work		
				185	how to calculate work		
				186	the work done by a force		
				187	work done against gravity		
				187	calculating work done against gravity		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				189	energy appears in different forms		
				190	different forms of energy		
				193	deriving the formula for kinetic energy		
				199	concept of work		
				200	calculate work done		
				207	calculate power in climbing stairs		
				208	power formulas		
				210	estimating the power in wind		
				211	power in biological systems		
				212	understand basic forms of energy		
				220	calculate power rating		
				223	momentum formula and calculating momentum		
				226	solving elastic and inelastic collision problems		
				229	momentum form of Newton's second law		
				229	force on a rocket from change in momentum		
				230	calculate change in momentum for elastic vs. inelastic collisions		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				236	momentum conservation of turbofan engine		
				238	momentum in billiards		
				239	calculate momentum		
				252	Newton's second law and natural frequency		
				276	natural frequency and harmonics		
				310	light is a form of energy		
				322	photons are bundles of light energy		
				378	electrical energy		
				384	batteries use chemical energy		
				409	power and efficiency of electric cars		
				552	explanation of pressure and energy		
				619	radiation as a flow of energy		
				622	energy of x-rays		
				647	energy from antimatter		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	7	creating theories based on observations	13	predict speed of ball
				60	creating the acceleration formula from experiments	18	how would acceleration be different?
				66	developing the formulas for a model of motion with constant acceleration	22	uniform acceleration model
				282	write a formula relating velocity of wave to period and wavelength	24	create an algebraic model
				312	light intensity follows an inverse square law	28	solve second law equation for string tension
				498	since wood is created from other matter it must not be a fundamental substance	32	develop a model that predicts acceleration
						33	calculate the predicted speed
						37	use your graph to make a prediction
						38	use your graph to make a prediction
						42	predict exact landing location
						43	create algebraic model
						49	write a formula
						65	predict where the ball moves fastest
						94	give an equation that describes your observations
						132	predict what the current will be
						189	Bernoulli's equation

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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)	11	Ptolemy model vs. Copernicus model of the solar system	13	create a graph
				40	making a good model	13	compare prediction to measurement
				43	graphs are a way of representing data	16	create a graph
				43	constructing a graph	16	describe the graph
				44	graphical models	22	create graphs
				44	using a graphical model to make a prediction and checking the model's accuracy	22	compare calculation with graph estimate
				45	recognizing patterns using graphs	22	how do you measured positions compare to model?
				54	constructing a graph	29	does experiment agree with prediction?
				54	understanding patterns in relationships between variables	37	make a graph
				55	create a graph from a data table	38	make a graph
				56	indicate relationships between variables in graphs	43	sketch four graphs
				246	understanding graphs of harmonic motion	43	how does the measurement compare to your prediction?
				290	the process of digital sound reproduction	56	create a graph
				297	frequency spectrum	66	create a graph of speed vs. position

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				304	comparison of wave forms from guitar sounds	114	are there differences between your prediction and measurement?
				307	decibel level vs. frequency graph for human hearing	135	graph voltage vs. current
				411	the waveform of AC electricity	136	graph voltage vs. current
				427	diagramming electric fields using field lines	151	make a graph of voltage vs. time
				443	diagramming magnetic fields using magnetic field lines	160	create a graph
				479	current vs.voltage graph for a transistor	167	make a graph of voltage vs. number of magnets
						169	make a current vs. voltage graph for the diode

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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)	194	the law of conservation of energy	66	law of conservation of energy
				194	conservation of energy explained	68	find the total energy at each position
				195	applying conservation of energy for a marble rolling on a hilly track	74	investigating collisions and conservation of energy
				195	conservation of energy in a closed system	78	which ball had a greater change in momentum?
				197	conservation of energy for Hoover Dam	177	observe a common phase change
				203	efficiency and conservation of energy		
				206	connection between efficiency and time		
				215	energy flows in biological systems		
				224	law of conservation of momentum		
				225	conservation of momentum in collisions		
				226	applying conservation of momentum		
				227	kinetic energy conservation for elastic collisions		
				227	momentum conservation for collisions in two and three dimensions		

Correlation to Arizona Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				231	conservation of angular momentum examples		
				232	conservation of angular momentum		
				235	jet engines work because of conservation of momentum		
				370	the equivalence of energy and matter		
				370	Einstein's thinking about momentum of particles moving near the speed of light		
				370	relationship and conservation of mass and energy		
				469	energy conservation and Faraday's law		
				509	melting		
				510	boiling		
				511	evaporation and condensation		
				515	thermodynamics and conservation of energy		
				552	conservation of energy in fluids		
				553	energy conservation and Bernoulli's equation		
				557	Boyle's law		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				558	Charles' law		
				564	using Boyle's law		
				580	quantum theory and matter and energy		
				629	conservation of energy in nuclear reactions		
				629	conservation of momentum in nuclear reactions		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	58	acceleration is the rate of change in the speed of an object	17	learn techniques for finding acceleration
				59	comparing speed and acceleration	17	studying acceleration
				60	formula for acceleration	20	understanding equation for uniform accelerated motion
				61	general definition of acceleration	27	were any forces acting on the ball?
				62	acceleration is total change of speed divided by total change in time	28	investigate Newton's second law
				64	calculating the speed of an object that is accelerating	30	investigate Newton's third law
				78	force is an action that can change motion	44	investigating force vectors
				81	force is related to acceleration	45	balancing a specified force
				81	Newton's second law of motion	49	draw a free body diagram and label forces
				83	finding the net force	64	relationship between work and energy
				84	direction of net force and acceleration and speed		
				84	calculating net force		
				84	Newton's second law and dynamics problems		
				85	finding force from acceleration		

Correlation to Arizona Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				86	zero acceleration means net zero force		
				87	forces always occur in action-reaction pairs		
				88	Newton's third law operates on pairs of objects		
				89	identifying which force is acting on which object		
				93	problems using Newton's first law and second law		
				100	friction is a force that resists motion		
				102	the normal force as the reaction in an action-reaction pair		
				103	net force includes the force of friction		
				106	net force must be zero in equilibrium		
				106	Newton's second law and net force		
				107	net force of zero and free-body diagram		
				108	equilibrium and Newton's second law		
				111	understanding reaction forces in terms of springs and deformation		

Correlation to Arizona Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				132	the force vector describes the strength and direction of a force		
				136	calculate the acceleration of a skier on a slope		
				137	the vector form of Newton's second law		
				141	calculate the net force		
				148	centripetal force causes circular motion		
				150	centripetal acceleration		
				185	work and energy		
				186	work done by a force at an angle to the distance		
				189	relationship between work and energy		
				191	the symmetry between work and energy		
				224	momentum and Newton's third law		
				228	Newton's second law relating force and momentum		
				254	definition of periodic force		
				425	electric forces always occur in pairs according to Newton's third law		
				548	Newton's third law and pressure in a fluid		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				550	pressure and the third law		
				557	pressure of gases		
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	152	description of law of universal gravitation	51	calculate gravitational force of attraction
				153	formula and calculations for law of universal gravitation	51	investigate law of universal gravitation
				154	orbital motion		
				158	calculate weight and acceleration due to gravity on Pluto		
				216	tides are due to force of gravity		
				642	Newton's laws and gravity		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
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	194	energy transformations	72	potential to kinetic energy conversion in a pendulum
				196	energy transformation hydroelectric plant	88	potential to kinetic energy conversions of a pendulum
				199	kinetic and potential energy conversions while bouncing in a trampoline		
				199	trace the energy transformations from sun to a flashing taillight		
				204	efficiency of Earth		
				205	calories in food		
				210	energy from the sun drives the weather on Earth		
				212	energy flow in a pendulum		
				215	energy flows in biological systems		
				245	kinetic to potential energy changes in motion of an oscillator		
				253	oscillators exchange energy back and forth between potential and kinetic		
				597	the energy of chemical bonds is described		
				625	energy changes in nuclear reactions		
				626	source of energy in nuclear reactions		

Correlation to Arizona Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Level	Concept	Performance Objective	student text pg	detail	investigation pg	detail
				627	fusion reactions and the sun		
				627	energy of fusion reactions		
				628	energy of fission reactions		
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	188	for all machines work out cannot exceed work in	64	compare output and input work