

Correlation to Illinois Learning Standards for Science

Foundations of Physics

Student Text and Investigation Manual

Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
11.A.4a Scientific Inquiry	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of scientific inquiry.	Formulate hypotheses referencing prior research and knowledge.	3	using life experiences and common sense	11	formulate a testable hypothesis
				8	formulating a hypothesis	16	what do the results tell you?
				10	the usefulness of phlogiston theory despite being incorrect	18	are the accelerations different?
				71	parachutes and air resistance	19	does the ball accelerate?
				306	explain why hearing can be damaged by loud sounds	33	formulate a testable hypothesis
						43	what would happen if...?
						48	formulate a hypothesis
						58	explain why the angular acceleration is different
						65	form a hypothesis
						79	write a 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?

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						133 analyze data and explain a rule 204 build models of Na and Cl and use them to explain bonding	

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
11.A.4b Scientific Inquiry	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of scientific inquiry.	Conduct controlled experiments or simulations to test hypotheses.	40	defining variables	11	recognizing and controlling variables
				42	control and experimental variables	21	conduct the experiment
				43	dependent and independent variables in graphs	28	set up the ultimate pulley
				54	importance of changing one variable at a time in an experiment	43	perform experiment
				242	finding a basic cycle of harmonic motion	65	investigate motion on a roller coaster
				251	changing the natural frequency of a stretched rubber band	67	set up the straight track
				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	determine which variable has the greatest effect
				467	experiment demonstrating electromagnetic induction	82	dependent and independent variables
						85	select appropriate technology to make measurements
						85	design and test a way to increase natural frequency
						129	choose circuit parts to light a bulb
						166	variables that affect the performance of the generator
						202	conduct your experiment

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
11.A.4c Scientific Inquiry	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of scientific inquiry.	Collect, organize and analyze data accurately and precisely.	43	constructing a graph	6	collecting data with precision
				43	graphs are a way of representing data	13	is there a trend in measurements?
				44	graphical models	13	create a graph
				45	recognizing patterns using graphs	15	collect time data with precision
				54	constructing a graph	15	collect time data
				54	understanding patterns in relationships between variables	15	record data in a table
				55	create a graph from a data table	16	create a graph
				55	create a graph from a data table	16	describe the graph
				56	indicate relationships between variables in graphs	17	use a data table
				56	indicate relationships between variables in graphs	18	record data
				142	finding x and y components of velocity for model rocket	18	collect time data with precision
				142	finding x and y components of velocity for model rocket	21	record results in table
				246	understanding graphs of harmonic motion	22	create graphs
				290	the process of digital sound reproduction	27	record position and time data
				290	the process of digital sound reproduction	29	record mass and force
				304	comparison of wave forms from guitar sounds	37	make a graph
304	comparison of wave forms from guitar sounds	38	make a graph				
307	decibel level vs. frequency graph for human hearing	43	sketch four graphs				
307	decibel level vs. frequency graph for human hearing	56	create a graph				
411	the waveform of AC electricity						

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				427	diagramming electric fields using field lines	63	as mechanical advantage increases what happens to length of pulled string?
				443	diagramming magnetic fields using magnetic field lines	66	create a graph of speed vs. position
				479	current vs.voltage graph for a transistor	66	what does the graph tell you?
						66	record data in table
						70	record data in table
						82	make three different graphs
						82	record your data in table
						82	create data table for self-designed experiment
						82	analyze data
						87	sketch a graph
						133	did battery voltage change?
						135	graph voltage vs. current
						136	graph voltage vs. current
						151	make a graph of voltage vs. time
						160	create a graph
						167	make a graph of voltage vs. number of magnets
						169	make a current vs. voltage graph for the diode

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
11.A.4d Scientific Inquiry	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of scientific inquiry.	Apply statistical methods to the data to reach and support conclusions.	43	draw a smooth curve; do NOT simply connect the dots	10	calculate percent difference
				48	slope of a position vs. time graph	13	find percent error
				63	acceleration and slope of a speed vs. time graph	16	find the slope of the line
				260	analyze graph of an oscillator	19	find the slope of the line
				412	average voltage and current of AC power	25	find the average time
						37	calculate percent difference
						38	calculate percent difference
						43	calculate percent difference
						58	find average of three trials
						67	calculate average of three times
						71	calculate average work and power
						83	calculate percent error
						202	find percent composition
						208	calculating percent yield

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11.A.4e Scientific Inquiry	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of scientific inquiry.	Formulate alternative hypotheses to explain unexpected results.	7 8 188	revising explanations through observation refining theories based on observations perpetual motion machines	12 33 50 66	do your results agree with hypothesis? does your experiment confirm your hypothesis? does your experiment provide confirmation? does this agree with your hypothesis?
11.A.4f Scientific Inquiry	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of scientific inquiry.	Using available technology, report, display and defend to an audience conclusions drawn from investigations.	42	writing procedures in a lab notebook helps make sure your results are repeatable	122 122 175 202	communicate your findings present your findings display information you found for your element keep detailed notes as you work
11.B.4a Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Identify a technological design problem inherent in a commonly used product.	113 113 543	conceptual design for a bridge the engineering design cycle failure analysis in the design process	163 163 173	propose solutions that will work for each disk apply steps of the design cycle to building different electric motors designing and building logic circuits

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
11.B.4b Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Propose and compare different solution designs to the design problem based upon given constraints including available tools, materials and time.	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

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
11.B.4c Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Develop working visualizations of the proposed solution designs (e.g., blueprints, schematics, flowcharts, cad-cam, animations).	42	writing procedures in a lab notebook helps make sure your results are repeatable	13	create a graph
						16	create a graph
						16	describe the graph
				43	constructing a graph	22	create graphs
				44	graphical models	28	interpret setup diagram
				54	constructing a graph	37	make a graph
				55	create a graph from a data table	38	make a graph
				107	drawing free-body diagrams	43	sketch four graphs
				116	draw a free-body diagram	56	create a graph
				125	drawing the velocity vector	66	create a graph of speed vs. position
				212	making an energy flow diagram	82	make three different graphs
				290	the process of digital sound reproduction	85	draw a sketch of your system
				333	drawing a ray diagram	87	sketch a graph
				342	drawing ray diagrams of lenses	92	sketch the wave fronts
				380	circuit diagrams and electrical symbols	122	communicate your findings
				411	the waveform of AC electricity	135	graph voltage vs. current
				427	drawing the electric field using field lines	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				

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				443	diagramming magnetic fields using magnetic field lines	169	make a current vs. voltage graph for the diode
11.B.4d Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Determine the criteria upon which the designs will be judged, identify advantages and disadvantages of the designs and select the most promising design.	113	test and evaluate the prototype structure design	83	design and construct a pendulum
				113	build and test a prototype structure out of toothpicks	85	create a system that oscillates
				113	conceptual design for a bridge	163	design and test different electric motors
				113	the engineering design cycle	163	propose solutions that will work for each disk
				389	electrical devices are designed to operate at a certain voltage	163	apply steps of the design cycle to building different electric motors
				543	evaluate three designs for a bridge	164	evaluate the performance of motor designs
				543	failure analysis in the design process	167	suggest improvements you could make to the generator design
						173	designing and building logic circuits
						191	build an air-speed tester
11.B.4e Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Develop and test a prototype or simulation of the solution design using available materials, instruments and technology	113	conceptual design for a bridge	163	propose solutions that will work for each disk

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
11.B.4f Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Evaluate the test results based on established criteria, note sources of error and recommend improvements.	113	test and evaluate the prototype structure design	83	design and construct a pendulum
				113	build and test a prototype structure out of toothpicks	85	create a system that oscillates
				113	conceptual design for a bridge	163	design and test different electric motors
				113	the engineering design cycle	163	propose solutions that will work for each disk
				389	electrical devices are designed to operate at a certain voltage	163	apply steps of the design cycle to building different electric motors
				543	evaluate three designs for a bridge	164	evaluate the performance of motor designs
				543	failure analysis in the design process	167	suggest improvements you could make to the generator design
						173	designing and building logic circuits
						191	build an air-speed tester
11.B.4g Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Using available technology, report to an audience the relative success of the design based on the test results and criteria.		data tables and graphs can be created on computer or graphing calculator	122	communicate your findings
				42	writing procedures in a lab notebook helps make sure your results are repeatable	122	present your findings
						175	display information you found for your element
						202	keep detailed notes as you work

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
12.C.5a Physics	Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.	Know and apply concepts that describe properties of matter and energy and the interactions between them.	Analyze reactions (e.g., nuclear reactions, burning of fuel, decomposition of waste) in natural and man-made energy systems.	189	energy appears in different forms	143	the cost of using electrical appliances
				190	different forms of energy	213	fusion and fission
				196	hydroelectric power system		
				196	environmental impacts of hydroelectric power		
				197	efficiency of the Hoover Dam		
				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	understand basic forms of energy		
				215	energy flows in biological systems		
				217	extracting tidal power		
				217	advantages of tidal energy		
				310	light is a form of energy		
				322	photons are bundles of light energy		
378	electrical energy						

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				384	batteries use chemical energy		
				470	energy for generators		
				502	elements past #92 are radioactive and decay		
				552	explanation of pressure and energy		
				570	use of radioactive isotopes in medicine		
				570	radioactive isotopes		
				573	nuclear reactions		
				573	fusion		
				579	structure of water molecule		
				593	chemical change example of burning		
				597	the energy of chemical bonds is described		
				602	formation of rust is a chemical reaction		
				602	hydrogen as a fuel		
				607	reactions of burning gasoline		
				608	alternate fuels to gasoline		
				614	radioactive decay		
				616	energy and radioactivity		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				618	power released by radioactive decay		
				619	radiation as a flow of energy		
				622	x-ray machines		
				622	energy of x-rays		
				623	CAT scans		
				625	nuclear reactions		
				625	energy changes in nuclear reactions		
				626	source of energy in nuclear reactions		
				627	energy of fusion reactions		
				627	fusion reactions and the sun		
				627	fusion reactions		
				628	energy of fission reactions		
				628	fission reactions		
				631	nuclear power application		
				631	nuclear power application		
				632	nuclear energy		
				632	nuclear energy		
				632	nuclear energy		
				634	comparison of fission and fusion		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				635	differences between fission and fusion		
				647	energy from antimatter		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
12.C.5b Physics	Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.	Know and apply concepts that describe properties of matter and energy and the interactions between them.	Analyze the properties of materials (e.g., mass, boiling point, melting point, hardness) in relation to their physical and/or chemical structures.	41	size and mass and shape are variables that affect motion	175	find the melting and boiling point
				503	molecules and properties of matter	175	find the density
				509	changing from solid to liquid	177	the density of ice vs. water
				510	changing from liquid to gas	201	identify physical properties of each material
				515	specific heat is a property of materials		
				540	density is independent of amount of substance		
				540	densities of common materials		
				540	definition of density and density formula		
				541	strength of materials depends on form and material		
				542	breaking strength of materials under stress		
				542	tensile strength is a physical property of matter		
				544	brittleness and elasticity are physical properties of matter		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				545	coefficient of thermal expansion is a property of matter		
				547	buoyancy explained		
				547	relationship between mass and volume and density		
				547	density of ice vs. liquid water		
				555	viscosity is a physical property of matter		
				556	density of gases can change		
				556	buoyancy of gases		
				559	gas constant is a property of a gas		
				561	buoyancy of Alvin		
				563	density is independent of size of material		
				622	x-rays are photons		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
12.D.5a Physics	Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.	Know and apply concepts that describe force and motion and the principles that explain them.	Analyze factors that influence the relative motion of an object (e.g., friction, wind shear, cross currents, potential differences.	41	effect of friction on motion of a ball on a ramp	23	investigate the effect of gravity
				61	any acceleration must come from a force	26	study Newton's first law
				68	free fall and acceleration due to gravity	27	collect data on Newton's first law
				69	motion formulas for free fall	27	were any forces acting on the ball?
				70	solving problems with free fall	27	explain how Newton's first law applies
				71	air resistance and terminal speed	28	investigate Newton's second law
				71	acceleration of gravity does not depend on mass	30	Newton's third law and free body diagrams
				72	friction and traction and antilock brakes	30	investigate Newton's third law
				75	problem understanding acceleration due to gravity	31	draw free body diagrams and identify action-reaction pairs
				78	changes in motion only occur through force	34	investigate static and sliding friction
				78	force is an action that can change motion	49	consider forces acting on the ball
				79	all objects tend to resist changes in motion	61	what effect does friction have on mechanical advantage?
				81	Newton's second law of motion	77	relationship between force and motion and the second law
				81	force is related to acceleration		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				83	calculation using Newton's second law		
				84	Newton's second law and dynamics problems		
				85	if there is acceleration there must be force		
				85	finding force from acceleration		
				85	force problems		
				87	forces always occur in action-reaction pairs		
				88	Newton's third law operates on pairs of objects		
				89	solving problems with action-reaction forces		
				89	identifying which force is acting on which object		
				93	problems using Newton's first law and second law		
				94	seat belt problem		
				97	strength of gravity on Earth and Jupiter		
				98	gravity and acceleration and weightlessness		
				99	balanced force problems		
				100	friction is a force that resists motion		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				100	the force of friction and the different types of friction		
				101	a model for friction		
				102	the normal force as the reaction in an action-reaction pair		
				102	calculating the force of friction		
				103	friction and motion		
				104	reducing friction force		
				105	friction applications		
				106	Newton's second law and net force		
				107	forces on a free-body diagram		
				108	equilibrium and Newton's second law		
				108	use equilibrium to find an unknown force		
				111	understanding reaction forces in terms of springs and deformation		
				112	analysis of forces on a bridge		
				115	friction of a pulled sled		
				116	calculate the acceleration of a toy		

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				124	effects of friction on trajectories		
				124	projectiles and trajectories		
				128	gravity only accelerates vertical motion		
				129	vertical motion of a projectile		
				130	projectiles launched at an angle		
				131	range of projectiles		
				133	balancing forces in two dimensions		
				134	resolving force of gravity in ramp coordinates		
				135	normal force of an inclined plane		
				135	frictional force on an inclined plane		
				135	acceleration down an inclined plane		
				136	calculating acceleration on a ramp		
				136	calculating acceleration on a ramp accounting for friction		
				137	the vector form of Newton's second law		
				137	calculating acceleration from 3-D forces		

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				141	effects of gravity on motion of a projectile		
				142	effects of friction on acceleration		
				148	direction of force determines linear or rotational motion		
				148	centripetal force causes circular motion		
				149	calculating centripetal force		
				150	formula for centripetal acceleration		
				152	law of universal gravitation and orbital motion		
				154	orbits and gravitational force		
				155	centripetal force and the law of universal gravitation combine to form the orbit equation		
				158	compare projectile motion to orbital motion		
				165	the motion of a tossed object		
				166	centers of mass and gravity may differ		
				168	Newton's first law and rotational inertia		

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				169	Newton's second law applies to rotational motion		
				171	Newton's second law for rotational motion variables		
				183	friction and mechanical advantage of wheel and axle		
				184	friction and mechanical advantage of ramps and screws		
				187	work done against gravity		
				191	potential energy comes from gravity		
				222	Newton's first law and momentum		
				224	momentum and Newton's third law		
				228	Newton's second law relating force and momentum		
				229	momentum form of Newton's second law		
				245	friction causes damping in oscillators		
				252	Newton's second law and natural frequency		
				254	definition of periodic force		
				256	friction and steady state		

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				425	electric forces always occur in pairs according to Newton's third law		
				548	Newton's third law and pressure in a fluid		
				550	pressure and the third law		
				557	pressure of gases		

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12.D.5b Physics	Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.	Know and apply concepts that describe force and motion and the principles that explain them.	Analyze the effects of gravitational, electromagnetic, and nuclear forces on a physical system.	68	free fall and acceleration due to gravity	23	investigate the effect of gravity
				69	motion formulas for free fall	51	calculate gravitational force of attraction
				70	solving problems with free fall	51	investigate law of universal gravitation
				71	acceleration of gravity does not depend on mass	122	study properties of the electromagnetic spectrum
				75	problem understanding acceleration due to gravity	213	fusion and fission
				97	strength of gravity on Earth and Jupiter		
				98	gravity and acceleration and weightlessness		
				124	projectiles and trajectories		
				128	gravity only accelerates vertical motion		
				129	vertical motion of a projectile		
				130	projectiles launched at an angle		
				131	range of projectiles		
				134	resolving force of gravity in ramp coordinates		
				135	acceleration down an inclined plane		
				141	effects of gravity on motion of a projectile		

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				152	law of universal gravitation and orbital motion		
				152	description of law of universal gravitation		
				153	formula and calculations for law of universal gravitation		
				154	orbital motion		
				154	satellites and orbital motion		
				154	orbits and gravitational force		
				155	satellite motion application		
				155	centripetal force and the law of universal gravitation combine to form the orbit equation		
				156	HEO and geostationary orbit		
				158	calculate weight and acceleration due to gravity on Pluto		
				158	compare projectile motion to orbital motion		
				165	the motion of a tossed object		
				166	centers of mass and gravity may differ		

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				187	work done against gravity		
				191	potential energy comes from gravity		
				216	tides are due to force of gravity		
				243	orbit is a type of cycle		
				262	waves are all around us		
				277	standing waves are used to store energy		
				281	use of microwaves in microwave ovens		
				311	fluorescent bulbs create UV light		
				320	visible light has just the right energy for life		
				320	the energy of IR and UV light		
				359	description and examples of infrared waves		
				359	descriptions of radio waves and microwaves and infrared rays		
				360	visible light waves		
				360	x-rays and gamma rays		
				360	description and examples of ultraviolet waves		
				419	differences between electric force and gravity		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				424	the strength of electric forces		
				426	gravity is far weaker than electric forces		
				428	comparison between electric fields and gravitational fields		
				452	MRI uses radio waves		
				502	elements past #92 are radioactive and decay		
				531	thermal radiation and infrared light		
				568	forces in the atom		
				570	radioactive isotopes		
				573	fusion		
				573	nuclear reactions		
				597	the energy of chemical bonds is described		
				614	radioactive decay		
				616	energy and radioactivity		
				624	UV light is ionizing radiation		
				625	nuclear reactions		
				625	energy changes in nuclear reactions		
				626	strong force and electromagnetic force in the nucleus		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				626	source of energy in nuclear reactions		
				627	fusion reactions		
				627	energy of fusion reactions		
				628	energy of fission reactions		
				628	fission reactions		
				635	differences between fission and fusion		
				642	Newton's laws and gravity		
				649	four forces in nature		
13.A.4a Practices of Science	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply the accepted practices of science.	Estimate and suggest ways to reduce the degree of risk involved in science activities.		featured throughout CPO Science program	79	safety note
				543	safety factors	129	safety precautions
						131	safety precautions
						150	safety note
						159	safety note
						160	electromagnet safety
						176	safety note
						176	heat safety
						185	safety tip
						192	gas pressure safety note
						206	acid safety

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
13.A.4b Practices of Science	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply the accepted practices of science.	Assess the validity of scientific data by analyzing the results, sample set, sample size, similar previous experimentation, possible misrepresentation of data presented and potential sources of error.	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?
				11	Ptolemy model vs. Copernicus model of the solar system	13	compare prediction to measurement
				25	why accuracy and precision are important	22	how do you measured positions compare to model?
				40	making a good model	22	compare calculation with graph estimate
				42	controlling variables in experiments	29	does experiment agree with prediction?
				44	checking a graphical model's accuracy	43	discuss sources of error
				44	using a graphical model to make a prediction and checking the model's accuracy	43	how does the measurement compare to your prediction?
				103	evaluating perpetual motion claims	45	discuss sources of errors
				297	frequency spectrum	76	compare predicted mass to actual mass
						97	reliability of a double-blind test
						97	did the method give an accurate result?
						114	are there differences between your prediction and measurement?
						202	identify two sources of experimental error

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
13.A.4c Practices of Science	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply the accepted practices of science.	Describe how scientific knowledge, explanations and technological designs may change with new information over time (e.g., the understanding of DNA, the design of computers).	41	Galileo and Newton conducted experiments with balls on ramps	75	the discovery of atom's nucleus
				78	Newton's laws of motion		
				81	Newton's discovery of the connection between force and mass and acceleration		
				152	Sir Isaac Newton and law of universal gravitation		
				349	Galileo and telescopes		
				350	Newtonian reflecting telescope		
				382	Ben Franklin and current		
				420	Charles-Augustin de Coulomb		
				499	development of atomic theory		
				580	Newton and classical physics		
614	Marie Curie						
615	Henri Bequerel and beta rays						

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
13.A.4d Practices of Science	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply the accepted practices of science.	Explain how peer review helps to assure the accurate use of data and improves the scientific process.	7	in science inquiry is used to uncover truth	80	explain the physics of a diver's somersaults
				19	problems in the real world use both metric and English units	92	how does sound get through tiny cracks?
				52	strobe photography	126	explain how polarizing sunglasses work
				52	Dr. Harold Edgerton and strobe photography		
				73	antilock braking systems		
				80	applications of Newton's first law		
				90	examples of Newton's third law in the real world		
				104	reducing friction and hovercraft and maglev trains		
				105	friction is useful for brakes and tires		
				109	jack-in-the-box uses a spring		
				112	design of structures		
				118	examples of scalars		
				130	kicked soccer ball acts as a projectile launched at an angle		
				131	hang time		
				133	example of gymnast for forces applied at an angle		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				138	robot navigation application		
				139	inertial navigation system		
				144	examples of objects moving in a circle		
				147	speedometers and odometers		
				149	centripetal force at the amusement park		
				155	satellite motion application		
				155	first artificial human-made Earth satellite was Sputnik		
				156	HEO and geostationary orbit		
				167	SUV rollovers and center of gravity		
				172	bicycle physics application		
				178	Great Pyramid of Giza and simple machines		
				227	accident reconstruction		
				232	angular momentum of skater spinning and diver		
				234	gyroscopes and angular momentum		
				250	why airplanes have tails		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				257	Pierre and Jacques Curie and the piezoelectric effect		
				262	examples of waves		
				269	wave motion and equilibrium		
				290	technological breakthrough of sound recording		
				290	stereo sound		
				299	understanding human hearing		
				310	past theories of light		
				323	glow-in-the-dark plastic		
				325	history of printing		
				337	rainbows are an example of dispersion		
				347	the compound microscope		
				348	the usefulness of recorded images		
				349	the telescope		
				361	Young's double-slit experiment		
				365	polarized sunglasses and LCD computer screens		
				368	Einstein's thinking revolutionized physics		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				390	breakdown voltage and lightning		
				398	holiday lights wired in series		
				401	why aren't birds electrocuted?		
				410	paying for electricity		
				413	wiring application		
				413	circuits in your house		
				418	charge of everyday objects		
				430	almost all electric appliances use capacitors		
				433	cameras use capacitors to supply energy for flash bulbs		
				447	discovering and using magnetism		
				448	how does a compass work?		
				458	where coils are used		
				462	electromagnet in a toaster		
				501	search for elements and alchemy		
				527	windchill factor		
				560	deep water submarine Alvin application		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				561	the Alvin research submarine		
				575	discovery of helium		
				608	how engines work		
				621	exposure to UV radiation		
				625	turning lead into gold		
				641	research on future of the universe		
				644	proof of Einstein's theory of general relativity		
				645	astronomers find black holes by what is around them		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
13.B.4a Science, Technology, and Society	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply concepts that describe the interaction between science, technology and society.	Compare and contrast scientific inquiry and technological design as pure and applied sciences.	12	engineers design practical devices for solving problems		
				31	use of nanotechnology		
				72	antilock brakes application		
				112	designing a bridge		
				138	use of robots		
				155	geostationary satellites		
				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		
				293	uses of Doppler radar		
				311	invention of electric light		
				325	the printing press		
				349	the telescope		
				378	importance of electricity		
				392	hybrid gas/electric cars application		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
				413	wiring application		
				434	how television works application		
				451	MRI application		
				490	why computers are useful		
				534	energy-efficient building application		
				623	creation of CAT scans		
				631	nuclear power application		
13.B.4b Science, Technology, and Society	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply concepts that describe the interaction between science, technology and society.	Analyze a particular occupation to identify decisions that may be influenced by a knowledge of science.	12	engineers design practical devices for solving problems		
				13	medical and health professions use physics		
				91	careers in biomechanics		
				227	police forensic scientists		
				289	careers in acoustics		
				404	electrical engineers		
				498	search for answers in physics and chemistry		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
13.B.4c Science, Technology, and Society	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply concepts that describe the interaction between science, technology and society.	Analyze ways that resource management and technology can be used to accommodate population trends.	219	using energy efficient products		
				392	hybrid cars combine advantages of gasoline fuel and electric power		
				392	environmental impact of auto pollution		
				534	energy-efficient building application		
				604	balancing chemical equation of acid rain		
				621	human technology contributes to radiation in environment		
				628	nuclear waste		
13.B.4d Science, Technology, and Society	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply concepts that describe the interaction between science, technology and society.	Analyze local examples of resource use, technology use or conservation programs; document findings; and make recommendations for improvements.	219	using energy efficient products		
				392	hybrid cars combine advantages of gasoline fuel and electric power		
				534	energy-efficient building application		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
13.B.4e Science, Technology, and Society	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply concepts that describe the interaction between science, technology and society.	Evaluate claims derived from purported scientific studies used in advertising and marketing strategies.	62 188 292 372 576	acceleration of cars perpetual motion machines sound in space holograms and science fiction special effects ôtransporter beamsö		