

Correlation to Kansas Science Education Standards (draft 2d)

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
1.1.1 SCIENCE AS INQUIRY – The student will develop the abilities necessary to do scientific inquiry and develop an understanding of scientific inquiry.	8 - 12	The student will demonstrate the abilities necessary to do scientific inquiry.	The student actively engages in asking and evaluating research questions.	3 using life experiences and common sense 3 inquiry starts with questions 242 finding a basic cycle of harmonic motion 456 an experiment with a wire and compass 463 building an electromagnet with wire and a nail 467 experiment demonstrating electromagnetic induction	43 perform experiment 65 investigate motion on a roller coaster 67 investigate motion on a roller coaster 89 what is it that moves in the case of a wave?

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1.1.2 SCIENCE AS INQUIRY – The student will develop the abilities necessary to do scientific inquiry and develop an understanding of scientific inquiry.	8 - 12	The student will demonstrate the abilities necessary to do scientific inquiry.	The student actively engages in investigations, including developing questions, gathering and analyzing data, and designing and conducting research	9 testing ideas against scientific evidence 40 defining variables 42 writing lab procedures 42 control and experimental variables 43 dependent and independent variables in graphs 54 importance of changing one variable at a time in an experiment 242 finding a basic cycle of harmonic motion 251 changing the natural frequency of a stretched rubber band 432 making a simple capacitor 456 an experiment with a wire and compass 463 building an electromagnet with wire and a nail 467 experiment demonstrating electromagnetic induction	11 recognizing and controlling variables 21 conduct the experiment 28 set up the ultimate pulley 43 write a procedure 43 perform experiment 65 investigate motion on a roller coaster 67 investigate motion on a roller coaster 67 set up the straight track 82 determine which variable has the greatest effect 82 dependent and independent variables 82 design an experiment 82 plan three experiments to determine which variable affects the period of a pendulum 85 design and test a way to increase natural frequency 85 select appropriate technology to make measurements 129 choose circuit parts to light a bulb

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					166 variables that affect the performance of the generator 201 develop a procedure 201 design a procedure to separate a mixture 202 conduct your experiment

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Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
1.1.3 SCIENCE AS INQUIRY – The student will develop the abilities necessary to do scientific inquiry and develop an understanding of scientific inquiry.	8 - 12	The student will demonstrate the abilities necessary to do scientific inquiry.	The student actively engages in using technological tools and mathematics in their own scientific investigations.	<p>data tables and graphs can be created on computer or graphing calculator</p> <p>23 reading a digital timer</p> <p>43 draw a smooth curve; do NOT simply connect the dots</p> <p>48 slope of a position vs. time graph</p> <p>60 creating the acceleration formula from experiments</p> <p>63 acceleration and slope of a speed vs. time graph</p> <p>66 developing the formulas for a model of motion with constant acceleration</p> <p>91 the force platform</p> <p>282 write a formula relating velocity of wave to period and wavelength</p> <p>312 light intensity follows an inverse square law</p> <p>383 using a multimeter to measure voltage</p> <p>385 measuring current with an ammeter or multimeter</p> <p>387 using a multimeter to measure resistance</p>	<p>4 using a timer</p> <p>5 using photogates</p> <p>7 using devices to measure mass</p> <p>9 using timer and photogates</p> <p>11 using timer and photogates</p> <p>14 using a timer and photogates</p> <p>16 find the slope of the line</p> <p>17 using a timer and photogates</p> <p>18 use a timer and photogates</p> <p>19 find the slope of the line</p> <p>21 use a timer and photogates</p> <p>22 uniform acceleration model</p> <p>23 use a timer and photogates</p> <p>25 create an algebraic model</p> <p>26 use a timer and photogates</p> <p>28 solve second law equation for string tension</p> <p>29 find mass</p>

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				504	Celsius and Fahrenheit thermometers	29	use a spring scale
				505	how thermometers work	32	develop a model that predicts acceleration
						34	use a spring scale
						39	using a compass
						42	use a timer and photogates
						43	create algebraic model
						44	use a spring scale
						47	use a timer and photogate
						49	write a formula
						50	use a timer and photogate
						58	use a timer and photogate
						60	use a spring scale
						65	use a timer and photogate
						67	use a timer and photogate
						75	use a timer and photogates
						82	use a timer and photogate
						87	use photogate and timer to measure the period
						89	use a spring scale to measure tension of string
						90	use a timer and photogates

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					93 use the timer to measure frequency
					94 give an equation that describes your observations
					106 experiment with mirrors
					112 use a laser and mirror to study law of reflection
					112 study reflection with a mirror
					115 use mirrors and lenses to learn how images are formed
					117 use a laser to locate images formed by a lens
					131 use a multimeter to measure current
					132 use a multimeter to measure voltage
					135 use a multimeter to measure current and voltage
					139 use a multimeter
					140 use the multimeter
					157 reading a compass
					163 use a multimeter
					164 use a multimeter to measure voltage
					165 use a multimeter

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Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
					166 use a photogate and timer 169 use a multimeter 171 use a multimeter 176 use a thermometer 178 measure the temperature 180 measure the temperature 189 Bernoulli's equation 192 check the pressure with your gauge 192 use a digital balance

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1.1.4 SCIENCE AS INQUIRY – The student will develop the abilities necessary to do scientific inquiry and develop an understanding of scientific inquiry.	8 - 12	The student will demonstrate the abilities necessary to do scientific inquiry.	The student actively engages in conducting an inquiry, formulating and revising his or her scientific explanations and models, and recognizing that potential alternative explanations and models should be considered.	7	revising explanations through observation	11 recognizing and controlling variables
				8	refining theories based on observations	12 was this experiment better or worse than the first?
				10	the usefulness of phlogiston theory despite being incorrect	13 create a graph
				11	Ptolemy model vs. Copernicus model of the solar system	13 compare prediction to measurement
				11	acceptance of the Copernican model of the solar system on the basis of scientific evidence	15 record data in a table
				11	acceptance of the Copernican model of the solar system on the basis of scientific evidence	15 collect time data
				25	why accuracy and precision are important	16 create a graph
				25	why accuracy and precision are important	16 describe the graph
				40	defining variables	16 what do the results tell you?
				40	defining variables	17 use a data table
				40	making a good model	18 record data
				42	control and experimental variables	18 are the accelerations different?
				42	control and experimental variables	19 does the ball accelerate?
				42	controlling variables in experiments	21 record results in table
				43	graphs are a way of representing data	22 how do you measured positions compare to model?
				43	graphs are a way of representing data	22 compare calculation with graph estimate
				43	constructing a graph	22 create graphs
				43	dependent and independent variables in graphs	
				44	graphical models	

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				44	using a graphical model to make a prediction and checking the model's accuracy
				44	checking a graphical model's accuracy
				45	recognizing patterns using graphs
				54	constructing a graph
				54	understanding patterns in relationships between variables
				54	importance of changing one variable at a time in an experiment
				55	create a graph from a data table
				56	indicate relationships between variables in graphs
				60	creating the acceleration formula from experiments
				66	developing the formulas for a model of motion with constant acceleration
				71	parachutes and air resistance
				103	evaluating perpetual motion claims
				22	uniform acceleration model
				25	find the average time
				25	create an algebraic model
				27	record position and time data
				28	solve second law equation for string tension
				29	record mass and force
				29	does experiment agree with prediction?
				32	develop a model that predicts acceleration
				37	make a graph
				38	make a graph
				43	how does the measurement compare to your prediction?
				43	discuss sources of error
				43	what would happen if...?
				43	sketch four graphs
				43	create algebraic model
				45	discuss sources of errors
				49	write a formula
				56	create a graph
				58	explain why the angular acceleration is different

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				142	58
					66
				246	66
				251	67
					70
				282	71
				290	76
				297	78
				304	80
				306	82
					82
				307	82
				312	82
				411	87
				412	87
				427	87

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				443	diagramming magnetic fields using magnetic field lines
				479	current vs.voltage graph for a transistor
				498	listing different types of matter in your home
					89 observe the wave pulse
					90 explain why higher tension makes waves move faster
					92 explain how wind might cause big waves in water
					94 give an equation that describes your observations
					97 reliability of a double-blind test
					97 did the method give an accurate result?
					109 explain how the colored filters work
					114 are there differences between your prediction and measurement?
					132 what conclusions can you draw?
					133 analyze data and explain a rule
					135 graph voltage vs. current
					136 graph voltage vs. current
					151 make a graph of voltage vs. time
					160 create a graph

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					166 variables that affect the performance of the generator 167 make a graph of voltage vs. number of magnets 169 make a current vs. voltage graph for the diode 189 Bernoulli's equation 202 identify two sources of experimental error 204 build models of Na and Cl and use them to explain bonding 206 record your observations
1.1.5 SCIENCE AS INQUIRY – The student will develop the abilities necessary to do scientific inquiry and develop an understanding of scientific inquiry.	8 - 12	The student will demonstrate the abilities necessary to do scientific inquiry.	The student actively engages in communicating and defending the design, results, and conclusion of his/her investigation.	42 writing procedures in a lab notebook helps make sure your results are repeatable 44 using a graph to make predictions 45 recognizing relationships between variables from graphs 246 understanding graphs of harmonic motion	122 communicate your findings 122 present your findings 175 display information you found for your element 202 keep detailed notes as you work

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1.1.6 SCIENCE AS INQUIRY – The student will develop the abilities necessary to do scientific inquiry and develop an understanding of scientific inquiry.	8 - 12	The student will demonstrate the abilities necessary to do scientific inquiry.	The student understands methods used to test hypotheses.	7 creating theories based on observations 11 Ptolemy model vs. Copernicus model of the solar system 40 making a good model 42 controlling variables in experiments 43 constructing a graph 44 graphical models 44 using a graphical model to make a prediction and checking the model's accuracy 54 constructing a graph 55 create a graph from a data table 60 creating the acceleration formula from experiments 66 developing the formulas for a model of motion with constant acceleration 188 perpetual motion machines 282 write a formula relating velocity of wave to period and wavelength 290 the process of digital sound reproduction	6 collecting data with precision 10 calculate percent difference 12 do your results agree with hypothesis? 13 compare prediction to measurement 13 create a graph 13 predict speed of ball 13 find percent error 15 collect time data with precision 16 what do the results tell you? 16 create a graph 16 describe the graph 18 are the accelerations different? 18 collect time data with precision 18 how would acceleration be different? 19 does the ball accelerate? 22 uniform acceleration model 22 create graphs

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				297	frequency spectrum	22	compare calculation with graph estimate
				306	explain why hearing can be damaged by loud sounds	22	how do you measured positions compare to model?
				312	light intensity follows an inverse square law	25	create an algebraic model
				411	the waveform of AC electricity	28	solve second law equation for string tension
				498	since wood is created from other matter it must not be a fundamental substance	29	does experiment agree with prediction?
						32	develop a model that predicts acceleration
						33	does your experiment confirm your hypothesis?
						33	calculate the predicted speed
						37	use your graph to make a prediction
						37	calculate percent difference
						37	make a graph
						38	calculate percent difference
						38	make a graph
						38	use your graph to make a prediction
						42	predict exact landing location
						43	discuss sources of error

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					43 create algebraic model
					43 what would happen if...?
					43 sketch four graphs
					43 calculate percent difference
					43 how does the measurement compare to your prediction?
					45 discuss sources of errors
					49 write a formula
					50 does your experiment provide confirmation?
					56 create a graph
					58 explain why the angular acceleration is different
					65 predict where the ball moves fastest
					66 create a graph of speed vs. position
					66 does this agree with your hypothesis?
					76 compare predicted mass to actual mass
					80 explain your observations
					82 make three different graphs
					83 calculate percent error

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					87 explain how force applied causes the response
					87 sketch a graph
					90 explain why higher tension makes waves move faster
					92 explain how wind might cause big waves in water
					94 give an equation that describes your observations
					109 explain how the colored filters work
					114 are there differences between your prediction and measurement?
					132 what conclusions can you draw?
					132 predict what the current will be
					133 analyze data and explain a rule
					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

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					169 make a current vs. voltage graph for the diode
					189 Bernoulli's equation
					202 find percent composition
					208 calculating percent yield

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2B.1.1 PHYSICS – The student will develop an understanding of the structure of atoms, compounds, chemical reactions, and the interactions of energy and matter.	8 - 12	The student will understand the relationships between force and motion.	The student understands Newton's Laws and the kinematic variables of time, position, velocity, and acceleration can be used to describe the position and motion of particles.	13 physics applies to the internal working of the body 13 physics and bicycles 13 biomechanics 18 definition of distance and length 26 weight is a measure of the force of gravity pulling on mass 26 calculating weight from mass 26 inertia is an effect of mass 27 understanding and measuring mass 36 the precise meaning of speed 36 speed is relative 37 how to calculate speed 37 calculating speed 38 the speed formula and calculating speed 38 compare and contrast speed and velocity 41 effect of friction on motion of a ball on a ramp 41 speed of a ball on a ramp	9 collect data and calculate speed of car 9 calculate speed of rolling marble 10 make object move with speed of 1 m/sec 12 finding speed of ball with one photogate 13 graph speed versus position 14 find the speed of the ball 15 find speed of the ball 16 create a speed vs. time graph 16 create a position vs. time graph 17 studying acceleration 17 learn techniques for finding acceleration 17 find two speeds 17 find the acceleration 19 make a speed vs. time graph 20 speed vs. time graph for uniform acceleration 20 understanding equation for uniform accelerated motion

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				46	21
				46	22
				47	22
				47	23
				48	25
				48	26
				48	26
				48	26
				49	27
				49	27
				50	28
				50	29
				54	30
				55	31
				55	

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				58	acceleration is the rate of change in the speed of an object	33	calculate the predicted speed
				59	comparing speed and acceleration	34	calculate the weight
				60	formula for acceleration	34	investigate static and sliding friction
				60	calculating acceleration from experiments	39	investigating vectors
				60	calculating acceleration from experiments	39	studying position vectors
				61	any acceleration must come from a force	40	using polar coordinates
				61	any acceleration must come from a force	41	calculate the resultant vector
				61	zero acceleration vs. constant acceleration vs. acceleration with zero speed	41	plotting position with cartesian coordinates
				61	constant speed and constant acceleration	42	find initial speed of ball
				61	constant speed and constant acceleration	43	calculate the velocity vector
				61	general definition of acceleration	44	investigating force vectors
				62	speed vs. time graph for accelerated motion	45	balancing a specified force
				62	acceleration is total change of speed divided by total change in time	45	calculate force components
				62	acceleration is total change of speed divided by total change in time	46	contrasting linear and angular motion
				63	calculating acceleration from a speed vs. time graph	46	investigating angular speed
				63	calculating acceleration from a speed vs. time graph	46	investigating angular speed
				63	complex speed vs. time graphs	49	draw a free body diagram and label forces
				63	complex speed vs. time graphs	49	draw a free body diagram and label forces
				64	calculate speed in accelerated motion	49	consider forces acting on the ball

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				64	calculate speed in accelerated motion	49	investigating centripetal force
				64	calculating the speed of an object that is accelerating	50	calculate the speed of the ball
				65	calculating distance from speed vs. time graph	51	calculate gravitational force of attraction
				67	calculate time and distance from acceleration	51	investigate law of universal gravitation
				68	free fall and acceleration due to gravity	52	converting mass to weight
				68	free fall and acceleration due to gravity	53	relationship between force and torque
				69	motion formulas for free fall	53	calculating torque
				70	solving problems with free fall	54	explore rotational equilibrium and net torque
				70	calculating height and time of flight in free fall problems	55	center of mass explained
				70	calculating height and time of flight in free fall problems	55	investigate center of gravity
				71	acceleration of gravity does not depend on mass	57	investigating rotational inertia
				71	air resistance and terminal speed	58	rotational application of Newton's second law
				72	friction and traction and antilock brakes	59	investigate block and tackle machine
				74	describing motion with speed vs. time graph	60	operate and study a block and tackle machine
				74	sketching speed vs. time graphs for different changes of motion	61	find the mechanical advantage

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				74	understanding average speed and instantaneous speed	61	what effect does friction have on mechanical advantage?
				75	problem understanding acceleration due to gravity	62	investigate block and tackle machine
				75	problem using frames of reference	66	find the speed of the ball
				75	calculations of speed	68	what is speed of the ball?
				76	analyzing graph for changes in motion	73	calculating momentum
				78	changes in motion only occur through force	73	momentum is a vector
				78	force is an action that can change motion	75	investigate collisions and conservation of momentum
				79	all objects tend to resist changes in motion	76	calculate speeds of projectile and target balls
				79	what systems in a car overcome the law of inertia	77	relationship between force and motion and the second law
				79	descriptions of inertia and Newton's first law	77	the momentum form of Newton's second law
				80	Newton's laws and cup holders	78	which ball had a greater change in momentum?
				80	seat belts and air bags and Newton's first law	79	investigate angular momentum
				81	force is related to acceleration	80	angular momentum behaves like a vector
				81	Newton's second law of motion	80	torque changes the direction of angular momentum vector

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				82	English unit of force is the pound	80	explain life application of conservation of momentum
				83	calculation using Newton's second law	84	restoring forces and equilibrium
				83	finding the net force	85	where is the mass that provides inertia?
				84	Newton's second law and dynamics problems	90	calculate the speed of the wave pulse
				84	calculating net force	128	relativity and frames of reference
				84	direction of net force and acceleration and speed	187	the stress formula
				85	force problems	188	measure tensile strength of a soft material
				85	finding force from acceleration	191	calculate speed of air in homemade air-speed tester
				85	if there is acceleration there must be force		
				86	zero acceleration means net zero force		
				87	forces always occur in action-reaction pairs		
				87	explaining Newton's third law in terms of an astronaut moving through space		
				87	forces always come in pairs		
				88	Newton's third law operates on pairs of objects		

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				88	
					explaining Newton's third law in terms of moving a skateboard
				89	
					identifying which force is acting on which object
				89	
					solving problems with action-reaction forces
				90	
					the natural jet engine in a squid
				90	
					examples of Newton's third law
				91	
					force platform used to analyze forces from running and walking
				92	
					force from a vertical jump
				92	
					measuring forces from a vertical jump
				93	
					problems using Newton's first law and second law
				93	
					explain the difference between mass and weight
				94	
					force calculations in different units
				94	
					inertia problem
				94	
					seat belt problem
				96	
					differences between mass and weight
				97	
					strength of gravity on Earth and Jupiter

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				97	calculating weight with mass and gravity
				98	gravity and acceleration and weightlessness
				98	weight and acceleration
				98	effects of g forces and zero gravity on the human body
				99	weight calculations
				99	balanced force problems
				99	weight is a force but mass is not
				100	the force of friction and the different types of friction
				100	friction is a force that resists motion
				101	a model for friction
				102	calculating the force of friction
				102	the normal force as the reaction in an action-reaction pair
				103	calculate the acceleration of a car including friction
				103	net force includes the force of friction
				103	friction and motion
				104	reducing friction force

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				105	friction is the force that keeps nails and screws in place
				105	friction applications
				106	Newton's second law and net force
				106	net force must be zero in equilibrium
				107	forces on a free-body diagram
				107	net force of zero and free-body diagram
				108	equilibrium and Newton's second law
				108	use equilibrium to find an unknown force
				109	restoring force of a spring
				109	the force from a spring
				110	restoring force of a spring
				110	Hooke's law and restoring force of a spring
				110	Hooke's law
				111	solid materials exert restoring force
				111	understanding reaction forces in terms of springs and deformation
				111	solid materials act like springs

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				112	analysis of forces on a bridge
				115	explain weight and mass
				115	friction of a pulled sled
				116	calculate mass from weight
				116	calculate the acceleration of a toy
				118	vectors have magnitude and direction
				119	displacement vectors
				119	the displacement vector and measuring displacement
				119	adding vectors
				120	adding vectors
				120	representing vectors in Cartesian and polar coordinates
				121	adding and subtracting vectors
				122	calculating vector components
				123	finding magnitude and angle of a vector
				124	definition of the velocity vector
				124	effects of friction on trajectories

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				124	projectiles and trajectories
				125	the velocity vector
				125	representing the velocity vector in polar and Cartesian coordinates
				125	speed is the magnitude of the velocity vector
				125	the velocity vector
				126	components of the velocity vector
				126	representing the velocity vector in polar and Cartesian coordinates
				126	components of the velocity vector
				127	calculating velocity vectors may require knowing frames of reference
				127	adding velocity vectors
				127	adding velocity vectors
				128	constant velocity of horizontal component of projectile motion
				128	gravity only accelerates vertical motion
				128	independence of horizontal and vertical motion in a velocity vector

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				129	vertical motion of a projectile
				129	analyze a horizontally launched projectile
				130	projectiles launched at an angle
				130	analyzing changing velocity in vertical component of projectile motion
				130	calculating velocity components of initial velocity
				131	range of projectiles
				132	interpreting the x-y components of force
				132	representing the force vector in Cartesian and polar coordinates
				132	the force vector describes the strength and direction of a force
				133	balancing forces in two dimensions
				133	calculating components of a force vector
				134	forces on an inclined plane
				134	resolving force of gravity in ramp coordinates

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Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				134	choosing coordinates for an inclined plane
				135	normal force of an inclined plane
				135	acceleration down an inclined plane
				135	frictional force on an inclined plane
				136	calculate the acceleration of a skier on a slope
				136	calculating acceleration on a ramp
				136	calculating acceleration on a ramp accounting for friction
				137	predicting motion in three dimensions and controlling force and acceleration in space missions
				137	calculating acceleration from 3-D forces
				137	the vector form of Newton's second law
				139	determining position by triangulation and inertial navigation
				141	explain vectors in Cartesian and polar coordinates

Correlation to Kansas Science Education Standards (draft 2d)

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				141	calculate the net force
				141	effects of gravity on motion of a projectile
				142	effects of friction on acceleration
				142	calculating acceleration for sled on slope
				144	rotation and revolution and angular speed
				145	calculating angular speed in radians per second
				146	calculating linear speed of a moving wheel
				146	the relationship between linear and angular speed
				146	angular speed of a moving wheel
				147	speedometers and odometers
				147	the linear speed of a rolling wheel
				148	acceleration can be a change in the direction of motion
				148	centripetal force causes circular motion
				148	direction of force determines linear or rotational motion

Correlation to Kansas Science Education Standards (draft 2d)

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				149	calculating centripetal force
				149	calculating centripetal force
				150	calculate the centripetal acceleration of a motorcycle
				150	formula for centripetal acceleration
				150	centripetal acceleration
				150	using centripetal acceleration to create the feeling of gravity by rotating the space station
				151	centrifugal force is actually an example of inertia
				151	banked turns
				152	description of law of universal gravitation
				152	attractive force between mass of person and mass of object is weight
				152	law of universal gravitation and orbital motion
				153	formula and calculations for law of universal gravitation

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Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				154	orbits and gravitational force
				154	satellites and orbital motion
				154	orbital motion
				155	centripetal force and the law of universal gravitation combine to form the orbit equation
				155	satellite motion application
				155	satellite motion application
				155	centripetal force and the law of universal gravitation combine to form the orbit equation
				156	HEO and geostationary orbit
				156	satellites in orbit
				157	compare linear and angular speeds
				158	calculate weight and acceleration due to gravity on Pluto
				158	calculating centripetal force
				158	compare projectile motion to orbital motion
				160	translation and rotation

Correlation to Kansas Science Education Standards (draft 2d)

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				160	using torque in household devices
				160	how torque and force differ
				160	center of rotation
				161	calculating torque using torque equation
				161	line of action and the torque created by a force
				161	force on a wrench
				162	units of torque
				162	calculating torque
				162	combining torques to find the net torque
				163	in rotational equilibrium the net torque is zero
				163	solve a rotational equilibrium problem
				164	when force and lever arm are not perpendicular
				164	calculate a torque from an angled force
				165	finding the center of mass
				165	the motion of a tossed object
				166	finding the center of gravity

Correlation to Kansas Science Education Standards (draft 2d)

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				166	centers of mass and gravity may differ
				166	finding the center of mass
				167	area of support
				167	balancing an object
				168	Newton's first law and rotational inertia
				168	rotational inertia and mass distribution
				169	rotational inertia
				169	relationship between angular acceleration and linear acceleration
				169	Newton's second law applies to rotational motion
				170	rotational inertia and center of mass
				170	moment of inertia
				171	Newton's second law for rotational motion variables
				171	rotational motion and linear motion
				171	angular acceleration of a wheel
				172	force and torque transformations in bicycles

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				173	force and torque transformations in bicycles
				173	changing gears in a bicycle
				174	compare force and torque
				174	calculating torque
				175	analyze centers of gravity
				175	analyze centers of mass
				178	input and output for simple machines
				178	how simple machines manipulate forces
				179	how to calculate mechanical advantage
				179	types of simple machines
				180	mechanical advantage of human arm
				180	the mechanical advantage of a lever
				181	torque and mechanical advantage of a lever
				181	how a lever works
				181	crowbar as an example of a lever
				181	how a lever works
				182	mechanical advantage of ropes and pulleys

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Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				183	friction and mechanical advantage of wheel and axle
				183	how wheels and gears work
				183	small drills use gears
				183	mechanical advantage of gears
				184	friction and mechanical advantage of ramps and screws
				184	screw turns rotating motion into linear motion
				184	ramps and screws
				186	work done by a force at an angle to the distance
				187	work done against gravity
				191	potential energy comes from gravity
				200	calculate fulcrum point of a lever
				209	estimating power requirements based on force
				216	tides are due to force of gravity
				222	Newton's first law and momentum

Correlation to Kansas Science Education Standards (draft 2d)

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				222	comparison of kinetic energy and momentum
				223	momentum formula and calculating momentum
				223	momentum is a vector
				224	law of conservation of momentum
				224	momentum and Newton's third law
				225	conservation of momentum in collisions
				226	solving elastic and inelastic collision problems
				226	applying conservation of momentum
				227	momentum conservation for collisions in two and three dimensions
				228	Newton's second law relating force and momentum
				228	seat belts and air bags
				228	car crash safety
				229	force on a rocket from change in momentum
				229	momentum form of Newton's second law
				230	impulse formula

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				230	calculate change in momentum for elastic vs. inelastic collisions
				231	conservation of angular momentum examples
				231	what is angular momentum
				231	linear and angular momentum
				232	angular momentum depends on speed and mass and shape
				232	conservation of angular momentum
				233	formula for angular momentum
				233	moment of inertia examples
				234	torque resists change in angular momentum
				234	gyroscopes and the space shuttle
				235	jet engines work because of conservation of momentum
				236	momentum conservation of turbofan engine
				237	why is momentum a vector

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				238	difference between impact and impulse
				238	momentum in billiards
				238	cars that crumple in a collision
				238	compare linear and angular momentum
				239	calculate momentum
				240	forces in a car stopping
				243	orbit is a type of cycle
				245	friction causes damping in oscillators
				249	harmonic motion in machines
				249	inertia and restoring force cause harmonic motion
				252	Newton's second law and natural frequency
				254	definition of periodic force
				256	friction and steady state
				260	position vs. time graph of harmonic motion
				260	velocity vs. time graph of harmonic motion
				276	natural frequency and harmonics
				366	special relativity and time dilation

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				367	relative motion and speed of light
				369	frequency of light depends on relative motion
				370	Einstein's thinking about momentum of particles moving near the speed of light
				371	simultaneity depends on the relative motion of your frame of reference
				425	electric forces always occur in pairs according to Newton's third law
				440	the difference between magnetic poles and electric charge
				442	torque between two magnets
				448	biological compasses of animals
				460	orbital motion of a charge
				541	force and stress
				542	stress and breaking
				548	Newton's third law and pressure in a fluid
				550	pressure and the third law
				557	pressure of gases

Correlation to Kansas Science Education Standards (draft 2d)

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				560	stress in the hull of Alvin
				563	stress vs. pressure
				564	calculating breaking stress
				629	conservation of momentum in nuclear reactions
				642	Newton's laws and gravity
				642	inertial mass
				643	frame of reference and the equivalence principle

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Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
2B.1.2 PHYSICS – The student will develop an understanding of the structure of atoms, compounds, chemical reactions, and the interactions of energy and matter.	8 - 12	The student will understand the relationships between force and motion.	The student understands physicists use conservation laws to analyze the motion of objects.	194 energy transformations 196 energy transformation hydroelectric plant 199 kinetic and potential energy conversions while bouncing in a trampoline 212 energy flow in a pendulum 224 law of conservation of momentum 225 conservation of momentum in collisions 226 applying conservation of momentum 227 momentum conservation for collisions in two and three dimensions 231 conservation of angular momentum examples 232 conservation of angular momentum 235 jet engines work because of conservation of momentum 245 kinetic to potential energy changes in motion of an oscillator 253 oscillators exchange energy back and forth between potential and kinetic	72 potential to kinetic energy conversion in a pendulum 78 which ball had a greater change in momentum? 88 potential to kinetic energy conversions of a pendulum

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Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				370 Einstein's thinking about momentum of particles moving near the speed of light 629 conservation of momentum in nuclear reactions	

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Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
2B.2.1 PHYSICS – The student will develop an understanding of the structure of atoms, compounds, chemical reactions, and the interactions of energy and matter.	8 - 12	The student will understand the conservation of mass and energy, and the First and Second Laws of Thermodynamics.	The student understands matter has energy. Mass and energy can be interchanged. The total energy in the universe is constant, but the type of energy may vary.	189 energy appears in different forms 190 conversions of energy 190 different forms of energy 194 conservation of energy explained 194 the law of conservation of energy 194 energy transformations 195 conservation of energy in a closed system 196 energy transformation hydroelectric plant 202 efficiency and energy conversions 203 efficiency and conservation of energy 205 efficiency in biological systems 206 connection between efficiency and time 212 energy conversion 212 understand basic forms of energy 213 the conversion process of energy flow 215 energy flows in biological systems	72 draw an energy flow diagram 128 the equivalence of mass and energy

Correlation to Kansas Science Education Standards (draft 2d)

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				219	
					energy flow of a model solar car
				227	
					kinetic energy conservation for elastic collisions
				256	
					resonant systems accumulate energy
				277	
					waves propagate by exchanging energy between two forms
				310	
					light is a form of energy
				320	
					photosynthesis converts light energy to chemical energy
				322	
					photons are bundles of light energy
				324	
					light from chemical reactions
				356	
					electromagnetic waves exchange energy between electricity and magnetic parts
				370	
					relationship and conservation of mass and energy
				370	
					Einstein's mass-energy formula
				378	
					electrical energy
				384	
					batteries use chemical energy

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				393	
				conversion of energy in regenerative braking	
				400	
				energy conversions in a series circuit	
				451	
				MRI--energy exchange by a nucleus in a magnetic field	
				464	
				electric motor uses electromagnets to convert electrical energy to mechanical energy	
				467	
				electric generators transform mechanical energy into electric energy	
				469	
				energy conservation and Faraday's law	
				515	
				thermodynamics and conservation of energy	
				552	
				conservation of energy in fluids	
				552	
				explanation of pressure and energy	
				553	
				energy conservation and Bernoulli's equation	
				616	
				energy and radioactivity	
				619	
				radiation as a flow of energy	
				622	
				energy of x-rays	
				625	
				nuclear reactions can convert mass into energy	

Correlation to Kansas Science Education Standards (draft 2d)

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				629 conservation of energy in nuclear reactions	
				629 energy is stored as mass in nuclear reactions	
				647 energy released in reactions between matter and antimatter	
				647 energy from antimatter	

Correlation to Kansas Science Education Standards (draft 2d)

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
2B.2.2 PHYSICS – The student will develop an understanding of the structure of atoms, compounds, chemical reactions, and the interactions of energy and matter.	8 - 12	The student will understand the conservation of mass and energy, and the First and Second Laws of Thermodynamics.	The student understands the first Law of Thermodynamics states the total internal energy of a substance will change only if heat is exchanged with the environment or work is done on or by the substance.	185 work and energy 185 how to calculate work 187 calculating work done against gravity 189 relationship between work and energy 189 energy appears in different forms 190 different forms of energy 191 the symmetry between work and energy 195 friction can divert some energy 195 frictional energy converted to heat 203 how friction affects machines 203 friction converts input work to heat 206 friction and the arrow of time 212 understand basic forms of energy 216 tidal energy represents frictional energy from the Earth-moon system 245 friction causes damping in oscillators 310 light is a form of energy	64 relationship between work and energy 67 friction as a source of energy dissipation 70 calculate work 71 calculate work done 182 investigate convection in a liquid

Correlation to Kansas Science Education Standards (draft 2d)

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				322	
					photons are bundles of light energy
				378	
					electrical energy
				384	
					batteries use chemical energy
				509	
					temperature change and thermal energy
				513	
					balance of thermal energy
				513	
					transfer of thermal energy
				522	
					thermal equilibrium
				522	
					heat conduction
				523	
					thermal conductors and insulators
				523	
					heat conduction
				524	
					conduction in solids and liquids and gases
				526	
					convection in liquids
				527	
					convection depends on speed and surface area
				528	
					convection and weather
				530	
					radiation
				535	
					sources of heat transfer in buildings
				537	
					heat flow between objects of different temperature
				552	
					explanation of pressure and energy

Correlation to Kansas Science Education Standards (draft 2d)

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				619 radiation as a flow of energy 622 energy of x-rays 647 energy from antimatter	
2B.2.3 PHYSICS – The student will develop an understanding of the structure of atoms, compounds, chemical reactions, and the interactions of energy and matter.	8 - 12	The student will understand the conservation of mass and energy, and the First and Second Laws of Thermodynamics.	The student understands the Second Law of Thermodynamics states the entropy of a system isolated from transfer of matter and/or energy will not decrease.	188 for all machines work out cannot exceed work in	64 compare output and input work

Correlation to Kansas Science Education Standards (draft 2d)

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
2B.3.1 PHYSICS – The student will develop an understanding of the structure of atoms, compounds, chemical reactions, and the interactions of energy and matter.	8 - 12	The student will understand the nature of the fundamental interactions of matter and energy.	The student understands there are four fundamental forces in nature: strong nuclear force, weak nuclear force, electromagnetic force, and gravitational force.	152 description of law of universal gravitation 153 formula and calculations for 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 314 Einstein's theory of relativity 366 relationship between matter and energy and time and space 367 speed of light paradox 368 speed and time and clocks 369 consequences of time dilation 371 simultaneity depends on the relative motion of your frame of reference 419 differences between electric force and gravity 424 the strength of electric forces 424 Coulomb's law	51 calculate gravitational force of attraction 51 investigate law of universal gravitation 127 when does special relativity become important? 148 investigate Coulomb's law 210 simulate radioactive decay 211 types of radiation

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				425	
				426	
				428	
				437	
				438	
				568	
				614	
				615	
				620	
				626	
				634	
				642	
				642	
				644	
				645	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				649 four forces in nature	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
2B.3.2 PHYSICS – The student will develop an understanding of the structure of atoms, compounds, chemical reactions, and the interactions of energy and matter.	8 - 12	The student will understand the nature of the fundamental interactions of matter and energy.	The student understands waves have energy and can transfer energy when they interact with matter.	254 concept of resonance 255 resonance occurs when periodic force matches natural frequency 259 resonance and amplitude 262 waves transmit energy 263 waves are a form of traveling energy 265 wave pulse 267 transverse and longitudinal waves 267 water waves are transverse and Slinky is longitudinal 268 one- and two- and three- dimensional waves 270 waves and reflection 270 waves and absorption 270 waves and refraction 270 waves and diffraction 270 concept of boundaries 271 waves and reflection and boundaries 271 waves and refraction and boundaries 271 curved boundaries	86 investigate resonance and its importance 89 study wave pulses on elastic cord 89 making wave pulses on a string 91 is your water wave transverse or longitudinal? 91 making plane waves in a ripple tank 91 make different types of waves in a ripple tank 91 making circular waves in a ripple tank 92 investigate diffraction in a ripple tank 92 investigate reflection in a ripple tank 92 observing reflection in water waves 95 natural frequency and resonance of standing waves on a string 95 waves carry energy from one place to another 101 investigate interference with sound waves 106 study reflection in a prism 106 study refraction in a prism

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page		
				272	waves transfer energy through absorption	106	use a mirror to study how light behaves
				272	waves and absorption and boundaries	112	investigate law of reflection
				272	waves and diffraction and boundaries	113	investigate Snell's law of refraction
				273	sound and light waves and interference	113	study how refraction works
				273	constructive and destructive interference	114	apply Snell's law of refraction
				274	how resonance is created	114	study the critical angle of refraction in a prism
				274	resonance and reflection	114	study index of refraction
				275	standing waves and natural frequency and resonance	116	investigate how a converging lens bends light
				275	standing waves on a string	123	study light diffraction patterns
				277	standing waves on a string	123	study light interference
				277	energy of a wave	124	use a spectrometer to measure wavelength of different colors of light
				278	modes of a wave		
				278	nodes and antinodes	125	polarization of water waves
				279	modes of vibration	125	polarization of a spring wave
				280	microwaves and resonance		
				283	type of wave represented by a spring	126	polarization of light
						126	study the polarization of light

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				292	
					sound is a longitudinal wave
				295	
					standing wave patterns of sound
				295	
					resonance of sound
				296	
					interference of sound waves
				301	
					consonance and dissonance and beats
				306	
					beats in a musical sound
				310	
					light is a form of energy
				312	
					the intensity of light
				313	
					light carries information
				314	
					the speed of light
				315	
					light rays bounce off a surface
				315	
					light bends as it moves into a material
				315	
					mirrors
				316	
					light and energy
				322	
					the photon theory of light
				324	
					the process of how light is reflected
				328	
					how is light used for communication?
				330	
					light rays indicate the path light travels

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				331	mirrors reflect light
				331	lenses bend light
				332	the image in a mirror
				332	specular and diffuse reflection
				333	finding the normal line for reflection
				333	the laws of reflection
				334	the index of refraction
				334	refraction is the bending of light rays
				335	Snell's law of refraction
				335	refraction depends on index of refraction in both materials
				336	total internal reflection and the critical angle
				338	how the human eye sees images
				339	the image formed in a mirror
				340	converging and diverging lenses
				340	lenses follow Snell's law of refraction
				340	design of a lens
				345	diffraction spot size image defect

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				352	law of reflection
				353	explain index of refraction
				354	using Snell's law
				356	electromagnetic waves are oscillations of an energy field
				356	light can be described in terms of waves
				357	frequency and wavelength of light
				357	relationship between frequency and energy and color of light
				358	index of refraction is ratio of speed of light in material to speed of light in vacuum
				358	speed of light is frequency multiplied by length
				361	interference of light waves and Young's double-slit experiment
				362	diffraction grating
				363	polarization
				364	polarizers
				365	applications of polarization

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				372	three-dimensional images and the human eye
				373	holograms and the interference of light
				373	wave fronts of light
				375	relate color to frequency for visible light
				530	absorption of thermal radiation
				530	energy and radiation relationships
				530	absorption of thermal radiation
				531	blackbody and perfect absorption of light
				574	absorption of light
				586	emission and absorption of photons in laser light

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
2B.3.3 PHYSICS – The student will develop an understanding of the structure of atoms, compounds, chemical reactions, and the interactions of energy and matter.	8 - 12	The student will understand the nature of the fundamental interactions of matter and energy.	The student understands electromagnetic waves result when a charged particle is accelerated or decelerated.	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 316 light and energy 320 the energy of IR and UV light 322 the photon theory of light 322 the photon theory of light 323 photons and the intensity of light 324 when the photon theory of light is useful 330 light rays indicate the path light travels 356 electricity and magnetism oscillations 359 descriptions of radio waves and microwaves and infrared rays 359 description and examples of infrared waves 360 x-rays and gamma rays 360 description and examples of ultraviolet waves	111 photons and quantum theory 129 construct simple electric circuits 131 construct a simple circuit 137 parallel circuit and Ohm's law 137 investigate series circuits 138 build a parallel circuit 139 analyze parallel circuits 146 build a simple electroscope 147 investigate the concept of electric charge 148 investigate Coulomb's law 149 investigate charged balloons 159 build an electromagnet 160 find out what happens to strength of electromagnet when current is increased 160 what happens to the strength of an electromagnet when you increase the current?

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				379	concept of a circuit
				380	understanding simple circuit and its diagram
				383	voltage is a measure of electric potential energy
				384	battery uses chemical energy to produce electrical charge
				386	simple bulb and battery circuits to illustrate electrical resistance
				388	calculate the current flowing in a circuit
				398	series circuit defined
				398	parallel circuit defined
				399	current and resistance in a series circuit
				400	voltage in a series circuit
				401	parallel circuits
				402	voltage and current in a parallel circuit
				403	resistance in parallel circuits
				405	voltage dividers
				407	solving network circuits
				407	solving network circuits

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				414	
					why parallel circuits are used in homes and buildings
				414	
					why series circuits are not used in homes and buildings
				418	
					electric charge is a fundamental property of matter
				419	
					electric forces are created between electric charges
				420	
					explanation of coulomb
				421	
					current is the flow of charge
				422	
					negative charge of electrons and current flow
				423	
					static electricity and charge polarization and induction
				424	
					relationship of electric force and charge
				424	
					Coulomb's law
				425	
					calculate force using Coulomb's law
				425	
					the force between charges
				426	
					charge creates an electric field
				428	
					source charges and test charges

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				430	
					a capacitor stores charge
				433	
					ability of a capacitor to store charge is capacitance
				435	
					steering the electron beam on television screen
				437	
					Coulomb's law is an inverse square law
				438	
					calculating charge using Coulomb's law
				452	
					MRI uses radio waves
				456	
					magnetic field of a wire
				457	
					force on a current in a magnetic field
				462	
					electromagnets
				463	
					building an electromagnet
				464	
					electric motor uses electromagnets to convert electrical energy to mechanical energy
				465	
					how electromagnets are used in electric motors
				472	
					electromagnet-based maglev
				475	
					diagram of electromagnet
				531	
					thermal radiation and infrared light
				581	
					quantum or photon theory of light

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				624 UV light is ionizing radiation	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page	
5.1.1 SCIENCE AND TECHNOLOG Y – The student will develop understandings about the relationship between science and technology.	8 - 12	The student will develop an understanding that technology is applied science.	The student understands technology is the application of scientific knowledge for functional purposes.	12 12 31 51 72 112 112 138 155 172 196 209 216 217 228 235	all technology is based on fundamental laws of physics engineers design practical devices for solving problems use of nanotechnology analyzing motion with video and strobe photography antilock brakes application designing a bridge relationship between science and engineering and technology use of robots geostationary satellites bicycle physics application hydroelectric power application range of power for common devices energy from ocean tides research into tidal power seat belts and air bags jet engines application	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				243	
					oscillators are used in communications and music and clocks
				257	
					quartz crystals application
				263	
					waves can carry information
				280	
					microwave ovens application
				293	
					uses of Doppler radar
				311	
					invention of electric light
				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
				392	
					hybrid gas/electric cars application
				413	
					wiring application
				429	
					electron beam accelerators
				434	
					how television works application
				451	
					MRI application

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				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	
				560 deep water submarine Alvin application	
				585 laser application	
				615 smoke detectors	
				623 creation of CAT scans	
				631 nuclear power application	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page		Volume Two Investigation Manual Page	
5.1.2 SCIENCE AND TECHNOLOG Y – The student will develop understandings about the relationship between science and technology.	8 - 12	The student will develop an understanding that technology is applied science.	The student understands creativity, imagination, and a broad scientific knowledge base are required to produce useful results.	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		
				367	Einstein and theory of special relativity		
				382	Ben Franklin and current		
				420	Charles-Augustin de Coulomb		
				499	development of atomic theory		
				560	deep water submarine Alvin application		
				580	Newton and classical physics		
				614	Marie Curie		
				615	Henri Bequerel and beta rays		

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page	
5.1.3 SCIENCE AND TECHNOLOG Y – The student will develop understandings about the relationship between science and technology.	8 - 12	The student will develop an understanding that technology is applied science.	The student understands science advances new technologies. New technologies open new areas for scientific inquiry.	12 12 31 51 72 112 112 138 155 172 196 209 216 217 228 235	all technology is based on fundamental laws of physics engineers design practical devices for solving problems use of nanotechnology analyzing motion with video and strobe photography antilock brakes application designing a bridge relationship between science and engineering and technology use of robots geostationary satellites bicycle physics application hydroelectric power application range of power for common devices energy from ocean tides research into tidal power seat belts and air bags jet engines application	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				243	
					oscillators are used in communications and music and clocks
				257	
					quartz crystals application
				263	
					waves can carry information
				280	
					microwave ovens application
				293	
					uses of Doppler radar
				311	
					invention of electric light
				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
				392	
					hybrid gas/electric cars application
				413	
					wiring application
				429	
					electron beam accelerators
				434	
					how television works application
				451	
					MRI application

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				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	
				560 deep water submarine Alvin application	
				585 laser application	
				615 smoke detectors	
				623 creation of CAT scans	
				631 nuclear power application	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
6.1.1 SCIENCE IN PERSONAL AND ENVIRONMEN TAL PERSPECTIV ES – The student will develop an understanding of personal and community health, population growth, natural resources, environmental quality...	8 - 12	The student will develop an understanding of the overall functioning of human systems and their interaction with the environment in order to understand specific mechanisms and processes related to health issues.	The student understands some chemical and physical hazards and accidents can be avoided through safety education.	543 safety factors	79 safety note 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

Correlation to Kansas Science Education Standards (draft 2d)

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page		Volume Two Investigation Manual Page
6.3.1 SCIENCE IN PERSONAL AND ENVIRONMEN TAL PERSPECTIV ES – The student will develop an understanding of personal and community health, population growth, natural resources, environmental quality...	8 - 12	The student will understand that human populations use natural resources and influence environmental quality.	The student understands natural resources from the lithosphere and ecosystems are required to sustain human populations.	556	air is a mixture of gases	
				601	elements forming the human body	
				601	amino acids from proteins that are the building blocks of living things	
				606	photosynthesis	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
6.3.2 SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES – The student will develop an understanding of personal and community health, population growth, natural resources, environmental quality...	8 - 12	The student will understand that human populations use natural resources and influence environmental quality.	The student understands Earth does not have infinite resources.	219 using energy efficient products 392 hybrid cars combine advantages of gasoline fuel and electric power 534 energy-efficient building application 632 nuclear energy	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
6.4.1 SCIENCE IN PERSONAL AND ENVIRONMEN TAL PERSPECTIV ES – The student will develop an understanding of personal and community health, population growth, natural resources, environmental quality...	8 - 12	The student will understand the effect of natural and human-influenced hazards.	The student understands natural processes of earth may be hazardous for humans.	502 elements past #92 are radioactive and decay 570 radioactive isotopes 573 fusion 573 nuclear reactions 604 balancing chemical equation of acid rain 614 radioactive decay 616 energy and radioactivity 621 sources of radiation in the environment 625 nuclear reactions 627 fusion reactions 628 fission reactions 632 nuclear waste 635 differences between fission and fusion	213 fusion and fission

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
6.4.2 SCIENCE IN PERSONAL AND ENVIRONMENTAL PERSPECTIVES – The student will develop an understanding of personal and community health, population growth, natural resources, environmental quality...	8 - 12	The student will understand the effect of natural and human-influenced hazards.	The student understands there is a need to assess potential risk and danger from natural and human-induced hazards	392 environmental impact of auto pollution 502 elements past #92 are radioactive and decay 543 safety factors 570 radioactive isotopes 604 balancing chemical equation of acid rain 607 impact of combustion reaction of gasoline 614 radioactive decay 616 energy and radioactivity 621 sources of radiation in the environment 621 human technology contributes to radiation in environment 628 nuclear waste 632 nuclear waste	79 safety note 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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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
6.5.1 SCIENCE IN PERSONAL AND ENVIRONMEN TAL PERSPECTIV ES – The student will develop an understanding of personal and community health, population growth, natural resources, environmental quality...	8 - 12	The student will develop an understanding of the relationship between science, technology, and society.	The student understands progress in science and technology can be affected by social issues and challenges. Science and technology indicate what can happen, not what should happen.	12 all technology is based on fundamental laws of physics 12 engineers design practical devices for solving problems 31 use of nanotechnology 51 analyzing motion with video and strobe photography 52 Dr. Harold Edgerton and strobe photography 52 Dr. Harold Edgerton and strobe photography 72 antilock brakes application 91 biomechanics application 92 applications of biomechanics 112 designing a bridge 112 relationship between science and engineering and technology 138 use of robots 155 geostationary satellites 155 first artificial human- made Earth satellite was Sputnik 172 bicycle physics application	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				178	
					Great Pyramid of Giza and simple 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
				243	
					oscillators are used in communications and music and clocks
				257	
					quartz crystals application
				257	
					Pierre and Jacques Curie and the piezoelectric effect
				263	
					waves can carry information
				269	
					wave motion and equilibrium
				280	
					microwave ovens application
				290	
					technological breakthrough of sound recording
				293	
					uses of Doppler radar
				310	
					past theories of light

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				311	
				invention of electric light	
				325	
				the printing press	
				325	
				history of printing	
				348	
				the usefulness of recorded images	
				349	
				the telescope	
				349	
				the telescope	
				361	
				Young's double-slit experiment	
				368	
				Einstein's thinking revolutionized physics	
				369	
				technological advances have allowed discovery of the expanding universe	
				372	
				holography application	
				378	
				importance of electricity	
				392	
				hybrid gas/electric cars application	
				392	
				hybrid gas/electric cars application	
				413	
				wiring application	
				429	
				electron beam accelerators	
				434	
				how television works application	
				447	
				discovering and using magnetism	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				451 MRI application	
				472 maglev train application	
				473 how magplanes levitate	
				490 why computers are useful	
				492 computers and electronic addition of numbers application	
				501 search for elements and alchemy	
				516 refrigerator application	
				534 energy-efficient building application	
				560 deep water submarine Alvin application	
				561 the Alvin research submarine	
				575 discovery of helium	
				585 laser application	
				615 smoke detectors	
				623 creation of CAT scans	
				625 turning lead into gold	
				631 nuclear power application	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
7.1.1 HISTORY AND NATURE OF SCIENCE – The student will develop understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives.	8 - 12	The student will develop an understanding that science is a human endeavor that uses models to describe and explain the physical universe.	The student demonstrates an understanding of science as both vocation and avocation.	12 engineers design practical devices for solving problems 13 medical and health professions use physics 13 medical and health professions use physics 15 physics plays a role in nearly everything a person does 91 careers in biomechanics 91 biomechanics application 227 police forensic scientists 289 careers in acoustics 296 ultrasound technology 367 Einstein and theory of special relativity 404 electrical engineers 449 Earth's magnetism 498 search for answers in physics and chemistry 560 deep water submarine Alvin application	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
7.1.2 HISTORY AND NATURE OF SCIENCE – The student will develop understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives.	8 - 12	The student will develop an understanding that science is a human endeavor that uses models to describe and explain the physical universe.	The student explains how science uses peer review, replication of methods, and norms of honesty.	7 11 25 40 42 44 297 498	13 13 18 22 22 29 33 37 38 42 43 65 76 114
				creating theories based on observations Ptolemy model vs. Copernicus model of the solar system why accuracy and precision are important making a good model writing procedures in a lab notebook helps make sure your results are repeatable using a graphical model to make a prediction and checking the model's accuracy frequency spectrum since wood is created from other matter it must not be a fundamental substance	predict speed of ball compare prediction to measurement how would acceleration be different? compare calculation with graph estimate how do you measured positions compare to model? does experiment agree with prediction? calculate the predicted speed use your graph to make a prediction use your graph to make a prediction predict exact landing location how does the measurement compare to your prediction? predict where the ball moves fastest compare predicted mass to actual mass are there differences between your prediction and measurement?

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Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
					122 communicate your findings 132 predict what the current will be 202 identify two sources of experimental error

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator		Volume One Student Text Page	Volume Two Investigation Manual Page
7.1.3 HISTORY AND NATURE OF SCIENCE – The student will develop understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives.	8 - 12	The student will develop an understanding that science is a human endeavor that uses models to describe and explain the physical universe.	The student recognizes the universality of basic science concepts and the influence of personal and cultural beliefs that embed science in society.	52	Dr. Harold Edgerton and strobe photography	
				52	Dr. Harold Edgerton and strobe photography	
				91	biomechanics application	
				92	applications of biomechanics	
				112	impact of technology	
				155	first artificial human- made Earth satellite was Sputnik	
				178	Great Pyramid of Giza and simple machines	
				257	Pierre and Jacques Curie and the piezoelectric effect	
				269	wave motion and equilibrium	
				290	technological breakthrough of sound recording	
				310	past theories of light	
				325	history of printing	
				348	the usefulness of recorded images	
				349	the telescope	
				361	Young's double-slit experiment	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				368 Einstein's thinking revolutionized physics	
				447 discovering and using magnetism	
				501 search for elements and alchemy	
				561 the Alvin research submarine	
				575 discovery of helium	
				625 turning lead into gold	
				641 research on future of the universe	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page		
7.1.4 HISTORY AND NATURE OF SCIENCE – The student will develop understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives.	8 - 12	The student will develop an understanding that science is a human endeavor that uses models to describe and explain the physical universe.	The student recognizes that society helps create the ways of thinking required for scientific advances, both toward training scientists and educating a populace to utilize benefits of science.	19	problems in the real world use both metric and English units	80	explain the physics of a diver's somersaults
				52	Dr. Harold Edgerton and strobe photography	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		
				91	biomechanics application		
				92	applications of biomechanics		
				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						

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				133	
					example of gymnast for forces applied at an angle
				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	
					first artificial human-made Earth satellite was Sputnik
				155	
					satellite motion application
				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

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				250	
					why airplanes have tails
				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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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				390	breakdown voltage and lightning
				398	holiday lights wired in series
				401	why aren't birds electrocuted?
				410	paying for electricity
				413	circuits in your house
				413	wiring application
				418	charge of everyday objects
				430	almost all electric appliances use capacitors
				433	cameras use capacitors to supply energy for flash bulbs
				440	scientists have never found single magnetic poles
				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

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				561	
					the Alvin research submarine
				568	
					understanding how gravity works inside atoms
				575	
					discovery of helium
				583	
					the meaning of the uncertainty principle
				608	
					how engines work
				621	
					exposure to UV radiation
				625	
					turning lead into gold
				637	
					areas of active research in physics
				640	
					unresolved questions of history of universe
				641	
					research on future of the universe
				641	
					research on future of the universe

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator		Volume One Student Text Page	Volume Two Investigation Manual Page	
7.1.5 HISTORY AND NATURE OF SCIENCE – The student will develop understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives.	8 - 12	The student will develop an understanding that science is a human endeavor that uses models to describe and explain the physical universe.	The student understands there are many issues which involve morals, ethics, values or spiritual beliefs that go beyond what science can explain, but for which solid scientific literacy is useful.		52 155 178 257 269 290 310 325 348 349 361 368 440 447	Dr. Harold Edgerton and strobe photography first artificial human- made Earth satellite was Sputnik Great Pyramid of Giza and simple machines Pierre and Jacques Curie and the piezoelectric effect wave motion and equilibrium technological breakthrough of sound recording past theories of light history of printing the usefulness of recorded images the telescope Young's double-slit experiment Einstein's thinking revolutionized physics scientists have never found single magnetic poles discovering and using magnetism	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				501 search for elements and alchemy	
				561 the Alvin research submarine	
				568 understanding how gravity works inside atoms	
				575 discovery of helium	
				583 the meaning of the uncertainty principle	
				625 turning lead into gold	
				637 areas of active research in physics	
				640 unresolved questions of history of universe	
				641 research on future of the universe	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
7.1.6 HISTORY AND NATURE OF SCIENCE – The student will develop understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives.	8 - 12	The student will develop an understanding that science is a human endeavor that uses models to describe and explain the physical universe.	The student recognizes society's role in supporting topics of research and determining institutions where research is conducted.	52 Dr. Harold Edgerton and strobe photography 91 biomechanics application 92 applications of biomechanics 112 impact of technology 641 research on future of the universe	
7.2.1 HISTORY AND NATURE OF SCIENCE – The student will develop understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives.	8 - 12	The student will develop an understanding of the nature of scientific knowledge.	The student understands scientific knowledge describes and explains the natural world.	7 in science inquiry is used to uncover truth 560 deep water submarine Alvin application 644 proof of Einstein's theory of general relativity 645 astronomers find black holes by what is around them	

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page		
7.2.2 HISTORY AND NATURE OF SCIENCE – The student will develop understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives.	8 - 12	The student will develop an understanding of the nature of scientific knowledge.	The student understands scientific knowledge begins with empirical observations, which are the data upon which further scientific knowledge is built.	4 18 25 154 211 243 259 498 646	learning about natural laws through inquiry and observation measuring distance accuracy and precision of measurements the orbits of planets and comets output power from plants is input power for animals examples of oscillators wing-beat cycle of a hummingbird listing different types of matter in your home a standard model for particle physics	1 6 13 15 43 60 63 66 67 78 82 82 87 89 109 110 133	estimating length accuracy and resolution and printing is there a trend in measurements? collect time data measure and record the distance measure input and output forces as mechanical advantage increases what happens to length of pulled string? what does the graph tell you? measure vertical distance observe what happens measure the length of the string analyze data observe what happens to the motion observe the wave pulse record observations examine the effects of glow-in-the-dark material did battery voltage change?

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Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page		Volume Two Investigation Manual Page	
						206	record your observations
7.2.3 HISTORY AND NATURE OF SCIENCE – The student will develop understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives.	8 - 12	The student will develop an understanding of the nature of scientific knowledge.	The student understands scientific knowledge consists of hypotheses, inferences, laws, and theories.	3	using life experiences and common sense	11	formulate a testable hypothesis
				4	inquiry through observation	33	formulate a testable hypothesis
				7	creating explanations through observation	43	test your prediction
				8	formulating a hypothesis	48	formulate a hypothesis
				8	forming hypotheses and testing with experiments	65	form a hypothesis
				8	testing hypotheses with experiments	65	where does the marble move the fastest?
				9	testing ideas against scientific evidence	79	write a hypothesis
				10	putting forth ideas and then testing them	82	plan three experiments to determine which variable affects the period of a pendulum
				323	using glow-in-the-dark plastic to demonstrate photon energy levels	111	do your observations support this hypothesis?
				423	charge by friction	147	how did A and B tapes acquire different charge?

Correlation to Kansas Science Education Standards (draft 2d)

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
7.2.4 HISTORY AND NATURE OF SCIENCE – The student will develop understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives.	8 - 12	The student will develop an understanding of the nature of scientific knowledge.	The student understands a testable hypothesis or inference must be subject to confirmation by empirical evidence.	18 measuring distance 25 accuracy and precision of measurements 188 perpetual motion machines 498 listing different types of matter in your home	1 estimating length 6 accuracy and resolution and printing 6 collecting data with precision 12 do your results agree with hypothesis? 13 is there a trend in measurements? 15 collect time data with precision 15 collect time data 18 collect time data with precision 33 does your experiment confirm your hypothesis? 43 measure and record the distance 50 does your experiment provide confirmation? 60 measure input and output forces 63 as mechanical advantage increases what happens to length of pulled string? 66 what does the graph tell you? 66 does this agree with your hypothesis?

Correlation to Kansas Science Education Standards (draft 2d)

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
					67 measure vertical distance 78 observe what happens 82 analyze data 82 measure the length of the string 87 observe what happens to the motion 89 observe the wave pulse 133 did battery voltage change? 206 record your observations

Correlation to Kansas Science Education Standards (draft 2d)

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
7.3.1 HISTORY AND NATURE OF SCIENCE – The student will develop understanding of science as a human endeavor, the nature of scientific knowledge, and historical perspectives.	8 - 12	The student will understand science from historical perspectives.	The student demonstrates an understanding of the history of science.	41 Galileo and Newton conducted experiments with balls on ramps 52 Dr. Harold Edgerton and strobe photography 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 208 James Watt 257 Pierre and Jacques Curie and the piezoelectric effect 311 Thomas Edison and the electric light 314 Einstein and the speed of light 316 Albert Einstein 349 Galileo and telescopes 350 Newtonian reflecting telescope 361 Thomas Young 366 Albert Einstein's theory of special relativity 367 Albert A. Michelson and Edward R. Morley	75 the discovery of atom's nucleus 147 Gilbert built the first electroscope

Correlation to Kansas Science Education Standards (draft 2d)

Foundations of Physics

Student Text and Investigation Manual

Standard #: Standard	Grade Level	Benchmark	Indicator	Volume One Student Text Page	Volume Two Investigation Manual Page
				382	
				Ben Franklin and current	
				400	
				Gustav Robert Kirchhoff	
				420	
				Charles-Augustin de Coulomb	
				440	
				magnetism	
				447	
				history of magnetism	
				499	
				development of atomic theory	
				501	
				ancient Greeks' ideas of elements	
				574	
				Niels Bohr	
				575	
				Johann Balmer	
				578	
				Wolfgang Pauli	
				580	
				Newton and classical physics	
				580	
				Max Planck and Albert Einstein	
				614	
				Marie Curie	
				615	
				Henri Bequerel and beta rays	
				630	
				Wolfgang Pauli	
				644	
				proof of Einstein's theory of general relativity	
				647	
				Paul Dirac	