

Correlation to Alabama Course of Study: Science
Physics: A First Course
Student Text and Investigation Manual

Standard #: Core	Strand	Benchmark	Volume One Student Text Page		Volume Two Investigation Manual Page	
INQ.01 Science	Process and Application	Understand fundamental assumptions about the universe upon which the scientific enterprise is based.	6	parts of a car and ramp system	5	investigate systems and change
			6	defining a system		
			10	an example system		
			10	car and ramp system		
			23	science helps us learn about natural world		
			240	energy and systems		

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INQ.02 Science	Process and Application	Discuss science as a body of knowledge and an investigative process.	23 science helps us learn about natural world	6 reflecting on the experiment 6 predict fastest car 7 construct explanations supported by evidence 9 how do your observations support your answer? 11 what experimental data support answer? 15 predict speed of car 21 predict speed of car 30 predict temperature of mixture 45 predict how many bounces the car will make 47 construct a reasonable explanation 60 propose a relationship between power and voltage 96 make predictions about natural frequency

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INQ.03 Science	Process and Application	Conduct scientific investigations systematically.	4	what is an experiment	6	reflecting on the experiment
			6	what is a variable	6	form a hypothesis
			8	scientific method	6	recognize and control variables
			8	formulating a hypothesis	6	do results agree with hypothesis?
			8	hypothesis defined	7	construct explanations supported by evidence
			8	cause and effect relationships	9	how do your observations support your answer?
			8	control and experimental variables	11	what experimental data support answer?
			8	dependent variables	27	identify and control variables
			8	independent variables	47	construct a reasonable explanation
			8	designing experiments	47	design an experiment
			8	asking a scientific question	60	propose a relationship between power and voltage
			16	graphs and dependent variables	94	investigate variables and how they affect the period of a pendulum
			16	graphs and independent variables	94	design pendulum experiments
			22	scientific method in action		
			24	importance of changing one variable at a time in an experiment		

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INQ.04 Science	Process and Application	Exhibit behaviors appropriate to the scientific enterprise consistently.	22 unexpected discoveries 23 science is a creative enterprise 53 science and photography 105 science and biomechanics 129 science and architecture 186 materials scientists 186 creativity and discoveries of Charles Goodyear 234 archaeologists 515 recording images	
INQ.05 Science	Process and Application	Demonstrate correct care and safe use of instruments, equipment, and chemicals.		16 safety with simple machines 48 demonstrate safe lab practices 67 short circuits and lab safety 70 capacitor safety

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INQ.06 Science	Process and Application	Demonstrate the ability to choose, construct, and/or assemble appropriate equipment for scientific investigations.	305 using a multimeter to measure current 307 using a multimeter to measure resistance	2 using timers and photogates 6 design a better experiment 13 design other experiments 15 design another experiment 22 use spring scales 44 using a timer and photogates 46 using a timer and photogates 47 conduct the experiment you designed 59 use a multimeter 61 using a multimeter to measure resistance 62 use a multimeter to measure current 63 use a multimeter to measure resistance of a pot 64 use a multimeter to measure voltage drop 65 use a multimeter to measure voltage 66 use a multimeter to measure current 74 use a multimeter to measure voltage

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				85 use a multimeter to measure voltage 86 use a timer and photogate to measure speed of rotor 93 use a timer and photogate to measure the period of a pendulum 96 use a timer and photogate to measure the natural frequency of an oscillator

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INQ.07 Science	Process and Application	Apply critical and integrated science- thinking skills.	4	what is an experiment	1 mixed units for time
			8	designing experiments	6 predict fastest car
			8	formulating a hypothesis	6 form a hypothesis
			11	communicating via measurement	7 collect precise data
			11	understand length measurement	8 make mass measurements
			11	importance of units	10 make length measurement
			12	systems of measurement	12 record the times
			13	time measurement units	14 measure mass of car
			14	basic unit of time	15 predict speed of car
			29	measuring mass	17 measure string length
			30	measuring force	19 measure the force
			56	analyze a speed/distance graph	21 predict speed of car
			65	joule is a unit of energy	22 measure force
			86	work and energy are measured in joules	23 measure the mass
			89	units of power	24 measure the time
			177	joules and heat energy	27 how can photogate ensure consistent results?
			302	measuring electric current	28 measure height of track
			303	measuring voltage	30 predict temperature of mixture
			327	electrical power is measured in watts	33 measure mass of ice and cup
			340	understanding coulombs	44 measure mass of car

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Standard #: Core	Strand	Benchmark	Volume One Student Text Page	Volume Two Investigation Manual Page
				44 make a precise time measurement 45 predict how many bounces the car will make 46 measure mass of car 47 design an experiment 47 analyze the results 50 measure volume 50 measure mass 59 work with volts and amps 76 measure mass of capacitor 78 estimate the precision of measurements 94 design pendulum experiments 96 make predictions about natural frequency

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INQ.08 Science	Process and Application	Use mathematical models, simple statistical models, and graphical models to express patterns and relationships determined from sets of scientific data.	4	what is analysis	4 construct a graph
			10	what is a model	6 use a data table
			16	steps to follow for graph construction	8 constant force data table
			16	constructing graphs	9 constant height data table
			19	mathematical descriptions	10 speed data table
			25	constructing a graph	11 create a graph
			26	interpreting distance/time graph	11 find formula for acceleration
			34	mathematical model of acceleration	13 collision data table
			35	Newton's second law equation	13 derive a formula
			41	average speed equation	15 graph speed vs. height
			43	calculating weight	17 calculate mechanical advantage
			46	motion graphs	17 derive a formula to use with ropes and pulleys
			48	motion graphs	18 output and input work data table
			56	analyze a speed/distance graph	18 output and input work data table
			61	momentum equation	19 force vs. distance data table
			62	relating impulse and momentum conservation	20 graph work done vs. deflection of rubber band
			68	kinetic energy formula	21 graph speed vs. rubber band deflection
			86	the work equation	22 force data table
			89	the power equation	25 graph friction vs. mass
			96	calculating mechanical advantage	25 rolling friction data table

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			112	using a graph to find force vector components	27	graph launch angle vs. range
			118	Hooke's law equation	29	calculate the ratio
			141	projectile motion problems	29	graph acceleration vs. steepness ratio
			143	calculating angular speed		
			144	finding the circumference of a circle	29	find a mathematical name for the steepness ratio
			145	linear speed equation	29	speed and height data table
			153	equation for law of universal gravitation	31	calculate temperature of mixture
			179	the heat equation	45	make a graph of efficiency vs. speed
			193	density formula		
			208	pressure and temperature relationship	47	analyze the results
			308	equation for Ohm's law	50	graph time vs. temperature
			342	equation for Coulomb's law	52	construct a graph
			419	harmonic motion graphs	52	find a percentage
			420	finding the amplitude on a harmonic motion graph	69	calculate power used by the bulb
			438	calculating wave speeds	71	find the average of the three times
			439	equation for the speed of a wave	75	graph current vs. time for the capacitor
			525	equation for the speed of light	75	derive a formula to calculate the charge
					76	calculate the number of electrons
					86	graph voltage vs. speed

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				94 sketch harmonic motion graphs 99 calculate natural frequency and period

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INQ.09 Science	Process and Application	Solve for unknown quantities by manipulating variables simultaneously.	19	mathematical descriptions	11	find formula for acceleration
			26	interpreting distance/time graph	13	derive a formula
			34	mathematical model of acceleration	17	calculate mechanical advantage
			35	Newton's second law equation	17	derive a formula to use with ropes and pulleys
			41	average speed equation	29	find a mathematical name for the steepness ratio
			43	calculating weight	29	calculate the ratio
			61	momentum equation	31	calculate temperature of mixture
			62	relating impulse and momentum conservation	69	calculate power used by the bulb
			68	kinetic energy formula	75	derive a formula to calculate the charge
			86	the work equation	76	calculate the number of electrons
			89	the power equation	99	calculate natural frequency and period
			96	calculating mechanical advantage		
			118	Hooke's law equation		
			141	projectile motion problems		
			143	calculating angular speed		
			144	finding the circumference of a circle		
			145	linear speed equation		
			153	equation for law of universal gravitation		
			179	the heat equation		
			193	density formula		

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			208 pressure and temperature relationship 308 equation for Ohm's law 342 equation for Coulomb's law 438 calculating wave speeds 439 equation for the speed of a wave 525 equation for the speed of light	
INQ.10 Science	Process and Application	Use written and oral communication skills to present and explain scientific phenomena and concepts individually or in collaborative groups using technical and non-technical language.	11 importance of units 11 communicating via measurement	67 explain what happened

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INQ.11 Science	Process and Application	Choose appropriate technology to retrieve relevant information from the Internet such as electronic encyclopedias, indices, and databases.	28 52 166 167 218 219	Newton and the history of physics history of high-speed photography Robert Brown and Brownian motion history of atomic theory atomic theory development of atom models
INQ.12 Science	Process and Application	Analyze the advantages and disadvantages of widespread use of and reliance on technology.	53 78 79 104 122 213 235 273 458 532	relationship between science and technology rocket technology new technologies prosthetic legs and technology maglev train technology deep water submarine technology technology and archaeology how a smoke detector works recording sound applications of polarization

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INQ.13 Science	Process and Application	Practice responsible use of technology systems, information, and software such as following copyright laws.	11 importance of units 11 communicating via measurement 305 using a multimeter to measure current 307 using a multimeter to measure resistance	2 using timers and photogates 44 using a timer and photogates 46 using a timer and photogates 59 use a multimeter 61 using a multimeter to measure resistance 62 use a multimeter to measure current 63 use a multimeter to measure resistance of a pot 64 use a multimeter to measure voltage drop 65 use a multimeter to measure voltage 66 use a multimeter to measure current 74 use a multimeter to measure voltage 85 use a multimeter to measure voltage 86 use a timer and photogate to measure speed of rotor 93 use a timer and photogate to measure the period of a pendulum

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				96 use a timer and photogate to measure the natural frequency of an oscillator
INQ.14 Science	Process and Application	Evaluate technology-based options for lifelong learning.	11 importance of units 11 communicating via measurement 19 mathematical models 23 impact of medical breakthroughs	

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INQ.16 Science	Process and Application	Collect data and construct and analyze graphs, tables, and charts using tools such as computer-based or calculator-based probeware.	11	measurement	2	using timers and photogates
			12	metric system	4	construct a graph
			13	measuring time	6	use a data table
			16	steps to follow for graph construction	7	collect precise data
			16	constructing graphs	8	constant force data table
			19	mathematical descriptions	9	constant height data table
			25	constructing a graph	10	speed data table
			26	interpreting distance/time graph	11	find formula for acceleration
			34	mathematical model of acceleration	11	create a graph
			35	Newton's second law equation	13	collision data table
			41	average speed equation	13	derive a formula
			43	calculating weight	15	graph speed vs. height
			46	motion graphs	17	calculate mechanical advantage
			48	motion graphs	17	derive a formula to use with ropes and pulleys
			61	momentum equation	18	output and input work data table
			62	relating impulse and momentum conservation	19	force vs. distance data table
			68	kinetic energy formula	20	graph work done vs. deflection of rubber band
			86	the work equation	21	graph speed vs. rubber band deflection
			89	the power equation	21	graph speed vs. rubber band deflection
			96	calculating mechanical advantage	22	force data table

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			112	using a graph to find force vector components	25	graph friction vs. mass
			118	Hooke's law equation	25	rolling friction data table
			141	projectile motion problems	27	graph launch angle vs. range
			143	calculating angular speed	27	how can photogate ensure consistent results?
			144	finding the circumference of a circle	29	calculate the ratio
			145	linear speed equation	29	find a mathematical name for the steepness ratio
			153	equation for law of universal gravitation	29	graph acceleration vs. steepness ratio
			179	the heat equation	29	speed and height data table
			193	density formula	31	calculate temperature of mixture
			208	pressure and temperature relationship	44	using a timer and photogates
			308	equation for Ohm's law	45	make a graph of efficiency vs. speed
			342	equation for Coulomb's law	46	using a timer and photogates
			419	harmonic motion graphs	50	graph time vs. temperature
			420	finding the amplitude on a harmonic motion graph	52	construct a graph
			438	calculating wave speeds	61	collect and record resistance data
			439	equation for the speed of a wave	69	calculate power used by the bulb
			525	equation for the speed of light		

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				75 graph current vs. time for the capacitor 75 derive a formula to calculate the charge 76 calculate the number of electrons 78 estimate the precision of measurements 86 use a timer and photogate to measure speed of rotor 86 graph voltage vs. speed 93 use a timer and photogate to measure the period of a pendulum 94 sketch harmonic motion graphs 96 use a timer and photogate to measure the natural frequency of an oscillator 99 calculate natural frequency and period
P.17 Physics	Forces and Motions	Describe the basic natural forces.	221 electromagnetic and strong force 342 electric forces are very strong	40 find mass number of specific isotope

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P.18 Physics	Forces and Motions	Understand the interrelationships among mass, distance, force, velocity, acceleration, and time.	17 speed of light 17 speed defined 17 constant speed 18 calculating speed 18 speed units 19 velocity defined 28 force defined 29 Newton's first law 30 units of force 32 acceleration defined 33 acceleration and velocity 35 Newton's second law 35 quantitative understanding of second law 36 applying Newton's second law properly 36 balanced and unbalanced forces 37 using second law formula 39 calculations pertaining to free fall 39 effect of gravity on motion 40 velocity defined 43 weight vs. mass 44 weight vs. mass	3 find the speed of the car 4 position vs. time graph 6 how can speed be measured? 7 measure the speed 8 investigate Newton's first law of motion 9 why did the speed change? 9 research and define inertia and weight and mass 10 find speed of car 10 investigate Newton's second law of motion 11 speed vs. time graph 12 investigate Newton's 3rd law of motion 13 relate Newton's 3rd law of motion to car collisions 21 measure speed of car 23 Newton's second law of motion 24 investigate effect of friction 25 calculate speed of car 25 apply Newton's second law of motion

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			119	friction explained
			120	static and sliding friction
			122	reducing friction
			123	useful friction
			128	the third law and physics of walls
			136	speed vs. velocity
			136	working with velocity vector
			137	projectile explained
			138	free fall component of a trajectory
			143	angular speed
			158	Newton's third law and helicopters
			402	gravitational field
			418	friction and damping
			424	Newton's second law and oscillators

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P.19 Physics	Forces and Motions	Explain the significance of slope and area under a curve when graphing motion data.	46 slope of a position vs. time graph 46 position vs. time graphs 47 position vs. time graph for accelerating motion 48 speed vs. time graph 49 speed vs. time graph for accelerating motion 50 slope of a speed vs. time graph 51 finding distance from a speed vs. time graph	4 position vs. time graph 11 speed vs. time graph 29 investigate slope
P.20 Physics	Forces and Motions	Analyze vector problems graphically and trigonometrically.	111 force vectors 112 resolving vectors 113 using a free-body diagram 115 finding resultant vector 136 working with velocity vector	23 draw a free body diagram 23 use force vectors
P.21 Physics	Forces and Motions	Use vectors to analyze the motion of an object acted upon by more than one force.	111 force vectors 112 resolving vectors 113 using a free-body diagram 115 finding resultant vector	23 draw a free body diagram 23 use force vectors

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P.22 Physics	Forces and Motions	Demonstrate an understanding of momentum.	61	calculating momentum	12	investigate momentum
			63	law of conservation of momentum	13	apply the law of conservation of momentum
			64	using momentum conservation to solve problems	13	calculate momentum of two cars
			74	momentum and collisions	13	analyze collision data
			77	momentum and car safety		
P.23 Physics	Forces and Motions	Explain planetary motion and navigation in space in terms of Kepler's and Newton's laws.	52	action-reaction pairs	12	investigate Newton's 3rd law of motion
			59	Newton's third law	13	relate Newton's 3rd law of motion to car collisions
			60	sorting out force pairs		
			78	third law and rockets		
			117	Newton's third law and springs		
			128	the third law and physics of walls		
			147	centripetal force		
			148	centripetal force		
			153	Newton's law of universal gravitation explained		
			154	understanding orbital motion		
			158	Newton's third law and helicopters		

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P.24 Physics	Forces and Motions	Apply quantitative relationships involving mass, weight, distance, work, power, gravitational potential energy, and kinetic energy.	29	mass and inertia	9 research and define inertia and weight and mass
			43	calculating weight from mass	14 investigate exchange of energy in car and track system
			43	weight vs. mass	15 calculate potential energy of car
			44	weight vs. mass	15 apply law of energy conservation
			66	energy is stored work	16 investigate simple machines
			67	calculating potential energy	17 calculate mechanical advantage
			67	potential energy explained	17 investigate mechanical advantage
			68	calculating kinetic energy	18 compare and contrast input and output work
			68	kinetic energy explained	19 investigate concept of energy as stored work
			68	potential to kinetic energy conversions	24 calculate kinetic energy of sled
			69	kinetic energy and stopping distance of a car	47 calculate energy
			70	law of conservation of energy	
			70	potential to kinetic energy conversions	
			71	using energy conservation to solve problems	
			86	calculating work	
			88	calculating work	
			89	calculating power	
			90	maximum power output of a person	

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			250 power in human technology 252 power in natural systems 254 tidal power 254 wave power	
P.25 Physics	Forces and Motions	Explain the laws of thermodynamics.	94 work and simple machines 101 output work is always less than input work	18 compare and contrast input and output work

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P.26 Physics	Forces and Motions	Describe relationships qualitatively and quantitatively between changes in heat energy and changes in temperature.	170	converting between Fahrenheit and Celsius	30	investigate difference between temperature and heat
			170	measuring temperature	30	measure final temperature
			172	kinetic theory and temperature	31	measure final temperature
			175	absolute zero	32	investiate concept of specific heat
			175	Kelvin and Celsius scales	33	measure final temperature
			176	understanding the difference between heat and temperature	48	measure temperature
			176	flow of thermal energy is heat	49	measure temperature
			177	calories explained	50	measure temperature
			177	heat and work		
			178	specific heat explained		
			179	the heat equation		
			181	thermal equilibrium		
			185	heat transfer is everywhere		
P.27 Physics	Interactions of Energy and Matter	Classify waves according to type.	436	longitudinal waves	98	study waves on a string
			436	transverse waves	99	explore transverse waves
			440	standing waves on a vibrating string	100	study water waves
					124	relating transverse waves on a spring to light waves

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P.28 Physics	Interactions of Energy and Matter	Explain wave behavior in terms of reflection, refraction, and diffraction.	442 refracted waves 442 reflected waves 443 diffraction explained 482 refraction of light 482 reflection of light 499 mirrors reflect light 501 reflection explained 502 the law of reflection 503 index of refraction 503 understanding refraction 504 angles of incidence and refraction 528 diffraction and light 530 diffraction gratings and spectrometers	113 investigate law of reflection 113 use a mirror to observe reflected light 114 use results to derive law of reflection 114 use a prism to investigate light rays 115 investigate refraction 119 investigate lenses and magnification 120 using a mirror to reflect light 120 investigate reflection of light 121 investigate refraction of light 121 use a lens to refract light 122 investigate diffraction of light
P.29 Physics	Interactions of Energy and Matter	Differentiate between constructive and destructive wave interference.	421 circular motion and phase 422 harmonic motion that is out of phase 445 destructive interference 445 constructive interference 469 frequency of sound and beats 529 interference of light waves	106 investigate interference and beats

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P.30 Physics	Interactions of Energy and Matter	Relate physical properties of sound and light to wave characteristics.	415 sound is a wave 425 period and natural frequency 426 resonance explained 434 waves transmit energy 437 frequency and amplitude and wavelength of waves 438 the speed of waves 445 constructive interference 445 destructive interference 446 how a laser works 446 natural frequency and resonance 447 waves and energy 454 sound is a wave 455 the decibel scale 455 acoustics 456 speed of sound 458 how sound is recorded 459 sound is a wave 461 how a French horn works 461 wavelength of sound 462 acoustics of concert halls 463 standing waves and resonance	96 expore natural frequency of an oscillator 101 investigate standing waves 101 investigate standing waves and frequency 102 harmonics and standing wave patterns 103 explore the concept of resonance 104 properties of sound waves 105 investigate sound wave interference 106 investigate interference and beats 109 harmonics and musical instruments 110 investigate sources of light 111 investigate the RGB model of color 111 reasearch and explain how the eye works 111 colors of light 112 investigate the CMYK model of color 113 use a mirror to observe reflected light 114 use a prism to investigate light rays

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P.31 Physics	Interactions of Energy and Matter	Explain the impact of change in media upon the speed, frequency, and wavelength of a wave.	437 frequency and amplitude and wavelength of waves 438 the speed of waves 461 wavelength of sound 481 speed of light 483 color and light 524 energy and color of light	101 investigate standing waves and frequency 123 measure wavelengths of visible light using a spectrometer 123 how colors of light relate to frequency and wavelength
P.32 Physics	Interactions of Energy and Matter	Describe how different components of the electromagnetic spectrum are used for communication purposes.	435 waves and technology 523 electromagnetic spectrum 524 wavelength and frequency of visible light 526 low-energy electromagnetic waves 527 high-energy electromagnetic waves 536 the electromagnetic spectrum 537 infrared telescopes	111 mixing primary colors of light 123 investigate visible light wavelengths

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P.33 Physics	Interactions of Energy and Matter	Demonstrate an understanding of reflection.	442	reflected waves	113	investigate law of reflection
			482	reflection of light	113	use a mirror to observe reflected light
			499	mirrors reflect light	114	use results to derive law of reflection
			501	reflection explained	120	using a mirror to reflect light
			502	the law of reflection	120	investigate reflection of light
P.34 Physics	Interactions of Energy and Matter	Demonstrate an understanding of refraction.	442	refracted waves	114	use a prism to investigate light rays
			482	refraction of light	115	investigate refraction
			503	index of refraction	119	investigate lenses and magnification
			503	understanding refraction	121	investigate refraction of light
			504	angles of incidence and refraction	121	use a lens to refract light
P.35 Physics	Interactions of Energy and Matter	Demonstrate an understanding of diffraction.	443	diffraction explained	122	investigate diffraction of light
			528	diffraction and light		
			530	diffraction gratings and spectrometers		
P.36 Physics	Interactions of Energy and Matter	Explain polarization.	531	polarization	125	explore polarization of light
					126	explore the concept of polarization of light

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P.37 Physics	Interactions of Energy and Matter	Describe similarities in the calculation of electrical force, magnetic force, and gravitational force between objects.	153 361 404	Newton's law of universal gravitation explained using magnetic forces the electric field	89	understand and investigate electric and gravitational fields
P.38 Physics	Interactions of Energy and Matter	Explain the production of static charge in an electroscope through induction and conduction.	340 341 341 344 354	understanding electric charge what causes shocks charged objects and static electricity how an electroscope works understanding lightning	72 73	investigate the nature of electric charge build an electroscope and conduct experiments
P.39 Physics	Interactions of Energy and Matter	Identify methods by which an electric field can be created.	364 365 387 404	electromagnets building an electromagnet electromagnetic induction explained the electric field	80 80 81 85 89	compare magnetic force and electric current in an electromagnet explore properties of electromagnets find relationship between current and magnetic field investigate electromagnetic induction understand and investigate electric and gravitational fields

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Standard #: Core	Strand	Benchmark	Volume One Student Text Page		Volume Two Investigation Manual Page	
P.40 Physics	Interactions of Energy and Matter	Apply quantitative relationships among charge, current, potential energy, potential difference, resistance, and electrical power for simple series, parallel, or combination DC circuits.	298	electric current	57	build circuits
			299	electric circuits	58	measure voltage
			299	examples of electric circuits in nature	58	investigate conductors and insulators
			300	resistors	59	measure current
			301	battery circuits	60	measure voltage
			302	current in simple circuits	60	a circuit with a dimmer switch
			303	understanding voltage	61	investigate resistance
			305	measuring current with a multimeter	62	investigate Ohm's law
			306	understanding electrical resistance	63	investigate resistance and potentiometers
			307	measuring resistance	63	use Ohm's law
			308	Ohm's law	64	investigating voltage drops
			309	resistance of common objects	65	build a circuit with three bulbs and a switch
			311	resistors	65	investigate series circuits
			318	series circuits	65	measure the voltage
			319	resistance in a series circuit	66	current in a series circuit
			319	current in a series circuit	66	investigate series circuits
			320	voltage in a series circuit	67	Ohm's law and short circuits
			321	Ohm's law and voltage drops	68	compare series and parallel circuits
			323	current in a parallel circuit	68	investigate parallel circuits
			323	parallel circuits	69	construct a simple circuit

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			324 voltage in a parallel circuit	69 finding power used by a circuit
			325 comparing series and parallel circuits	70 explain what you observed in terms of energy and power
			326 parallel circuits in homes	
			328 calculating power in a circuit	71 calculate energy and power
			340 understanding electric charge	72 investigate the nature of electric charge
			341 what causes shocks	74 investigate the flow of electric charge
			341 charged objects and static electricity	
			346 charge and current	75 work with Ohm's law
			349 voltage and charge	
			351 voltage and capacitors	
			354 understanding lightning	
P.41 Physics	Interactions of Energy and Matter	Determine the force on charged particles using Coulomb's law.	342 understanding Coulomb's law	

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P.42 Physics	Interactions of Energy and Matter	Demonstrate an understanding of the scientific implications of the following as they relate to the nature of particles (atoms).	28 Newton and the history of physics 52 contributions of Harold Edgerton 52 history of high-speed photography 79 contributions of Robert Goddard 166 Robert Brown and Brownian motion 167 history of atomic theory 218 atomic theory 219 development of atom models	