

Correlation to Florida Physics I: Course # 2003380

Physics: A First Course

Student Text and Investigation Manual

Standard #: Course	Strand	Standard	Benchmark	Volume One Student Text Page		Volume Two Investigation Manual Page	
SC.A.1.4.2 Physics I	Wave characteristics, energy, and dynamics	Demonstrate understanding and apply knowledge of wave characteristics, energy, and dynamics	The student knows that the vast diversity of the properties of materials is primarily due to variations in the forces that hold molecules together.	221	electromagnetic and strong force	40	find mass number of specific isotope
				342	electric forces are very strong	77	investigate the strength of magnetic force
				360	what is a magnet	79	investigate interactions of different materials with magnets
				361	using magnetic forces		
				362	magnetic fields	81	compare electromagnet and permanent magnet
				363	magnetic field lines		
				374	magnets and MRI scanners	88	investigate magnetic fields
				381	magnetic field of a wire	89	understand and investigate electric and gravitational fields
				404	the electric field	90	use magnetic fields to solve a puzzle

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SC.A.1.4.3 Physics I	Wave characteristics, energy, and dynamics	Demonstrate understanding and apply knowledge of wave characteristics, energy, and dynamics	The student knows that the vast diversity of the properties of materials is primarily due to variations in the forces that hold molecules together.	5	matter defined	35	investigate density
				5	is air matter		
				7	matter is made of atoms		
				166	matter is composed of atoms		
				168	definition of atom		
				172	random motion of atoms		
				173	phases of matter		
				176	flow of thermal energy is heat		
				185	heat transfer is everywhere		
				186	physical properties of vulcanized rubber		
				186	physical properties of carbon nanotubes		
				187	physical properties of nitinol		
				192	chemical properties of matter		
				200	density of fluids		
				201	comparing liquid and solid densities		
				263	physical and chemical changes		
				340	atoms are the source of electric charge		
				341	matter is made of atoms		

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SC.A.2.4.4 Physics I	Energy and matter	Demonstrate understanding of interactions of energy and matter.	The student knows that nuclear energy is released when small, light atoms are fused into heavier ones.	221	weak force explained	51	investigate concepts of radioactivity
				222	radioactive decay	52	investigate concept of half-life
				269	fusion reactions		
				270	radioactive materials		
				270	fission reactions		
				271	types of radioactivity		
				272	half-life		

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SC.A.2.4.6 Physics I	Wave characteristics, energy, and dynamics	Demonstrate understanding and apply knowledge of wave characteristics, energy, and dynamics	The student understands that matter may act as a wave, a particle, or something else entirely different within its own characteristic behavior.	415	sound is a wave	98	study waves on a string
				436	transverse waves	99	explore transverse waves
				436	longitudinal waves	100	study water waves
				437	frequency and amplitude and wavelength of waves	101	investigate standing waves and frequency
				438	the speed of waves	104	properties of sound waves
				440	standing waves on a vibrating string	105	investigate sound wave interference
				442	refracted waves	106	investigate interference and beats
				442	reflected waves	111	research and explain how the eye works
				443	diffraction explained	123	measure wavelengths of visible light using a spectrometer
				443	absorption explained	123	how colors of light relate to frequency and wavelength
				445	destructive interference	124	relating transverse waves on a spring to light waves
				445	constructive interference	125	explore polarization of light
				454	sound is a wave	126	explore the concept of polarization of light
				458	how sound is recorded		
				459	sound is a wave		
				461	wavelength of sound		
				467	how the ear works		
				469	frequency of sound and beats		
				483	color and light		
				484	how the human eye sees light		
486	photons						

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				524 energy and color of light 531 polarization 533 photon theory of light	

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SC.B.1.4.1 Physics I	Conservation of energy and momentum	Demonstrate understanding of conservation of energy and momentum.	The student understands how knowledge of energy is fundamental to all the scientific disciplines (e.g., the energy required for biological processes in living organisms and the energy required for the building, erosion, and rebuilding of the Earth).	9	basic forms of energy	13	apply the law of conservation of momentum
				10	conservation of energy		
				63	law of conservation of momentum	14	investigate exchange of energy in car and track system
				64	using momentum conservation to solve problems	15	apply law of energy conservation
				66	energy is stored work	19	investigate concept of energy as stored work
				67	potential energy explained		
				68	potential to kinetic energy conversions	33	investigate energy and phase changes
				68	kinetic energy explained	34	apply concept of energy and phase changes
				70	law of conservation of energy	42	model how atoms exchange energy
				70	potential to kinetic energy conversions	45	describe energy changes
				71	using energy conservation to solve problems	46	investigate energy flow in a system
				74	momentum and collisions	47	identify forms of energy in an experimental system
				77	momentum and car safety	47	draw an energy flow diagram
				117	potential and kinetic energy in a spring	57	draw energy flow diagram of the circuit
				240	energy and systems		
				241	energy exists in many different forms		
				243	energy flow diagrams		

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				249 energy flow diagram for mechanical systems	
				249 mechanical systems and energy	
				251 energy flow in natural systems	
SC.B.1.4.2 Physics I	Conservation of energy and momentum	Demonstrate understanding of conservation of energy and momentum.	The student understands that there is conservation of mass and energy when matter is transformed.	10 conservation of energy 67 potential energy explained 68 kinetic energy explained 70 law of conservation of energy 71 using energy conservation to solve problems 240 energy and systems 243 energy flow diagrams 249 energy flow diagram for mechanical systems 251 energy flow in natural systems 265 law of conservation of mass	14 investigate exchange of energy in car and track system 15 apply law of energy conservation 42 model how atoms exchange energy 45 describe energy changes 46 investigate energy flow in a system 47 draw an energy flow diagram 57 draw energy flow diagram of the circuit

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SC.B.1.4.3 Physics I	Energy and matter	Demonstrate understanding of interactions of energy and matter.	The student knows that temperature is a measure of the average translational kinetic energy of motion of the molecules in an object.	170	converting between Fahrenheit and Celsius	30	measure final temperature
				170	measuring temperature	31	measure final temperature
				172	kinetic theory and temperature	32	investiate concept of specific heat
				175	absolute zero	33	measure final temperature
				175	Kelvin and Celsius scales	48	measure temperature
				178	specific heat explained	49	measure temperature
						50	measure temperature
SC.B.1.4.4 Physics I	Energy and matter	Demonstrate understanding of interactions of energy and matter.	The student knows that as electrical charges oscillate, the create time-varying electric and magnetic fields that propagate away from the source as an electromagnetic wave.	361	using magnetic forces	78	use a compass to investigate magnetic forces
				364	electromagnets		
				365	building an electromagnet	80	use a compass to detect magnetic force from electromagnet
				369	compass		
				370	how a compass works		
				380	effect of current on a compass	80	compare magnetic force and electric current in an electromagnet
				387	electromagnetic induction explained	80	explore properties of electromagnets
				389	how a generator works	81	find relationship between current and magnetic field
				522	electromagnetic waves		
						85	investigate electromagentic induction
						87	investigate how generators work

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SC.B.1.4.6 Physics I	Energy and matter	Demonstrate understanding of interactions of energy and matter.	The student knows that the first law of thermodynamics relates the transfer of energy to the work done and the heat transferred.	66	energy is stored work	18	compare and contrast input and output work
				94	work and simple machines	19	investigate concept of energy as stored work
				101	output work is always less than input work	44	friction and energy dissipation
				240	energy and systems	45	describe energy changes
				243	energy flow diagrams	46	investigate energy flow in a system
				251	energy flow in natural systems	47	investigate friction as a part of energy flow
						57	draw energy flow diagram of the circuit

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SC.B.1.4.7 Physics I	Energy and matter	Demonstrate understanding of interactions of energy and matter.	The student knows that the total amount of usable energy always decreases, even though the total amount of energy is conserved in any transfer.	9	basic forms of energy	14	investigate exchange of energy in car and track system
				10	conservation of energy		
				66	energy is stored work	15	apply law of energy conservation
				67	potential energy explained		
				68	potential to kinetic energy conversions	18	compare and contrast input and output work
				68	kinetic energy explained	19	investigate concept of energy as stored work
				70	potential to kinetic energy conversions	42	model how atoms exchange energy
				70	law of conservation of energy	44	friction and energy dissipation
				71	using energy conservation to solve problems	45	describe energy changes
				94	work and simple machines	46	investigate energy flow in a system
				101	output work is always less than input work	47	investigate friction as a part of energy flow
				117	potential and kinetic energy in a spring	47	identify forms of energy in an experimental system
				240	energy and systems	47	draw an energy flow diagram
				241	energy exists in many different forms	57	draw energy flow diagram of the circuit
				243	energy flow diagrams		
				249	energy flow diagram for mechanical systems		
				249	mechanical systems and energy		

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				251	energy flow in natural systems		
SC.B.2.4.1 Physics I	Energy and matter	Demonstrate understanding of interactions of energy and matter.	The student knows that the structure of the universe is the result of interactions involving fundamental particles (matter) and basic forces (energy) and that evidence suggests that the universe contains all the matter and energy that ever existed.	9 241 280	basic forms of energy energy exists in many different forms meaning of Einstein's formula	47	identify forms of energy in an experimental system
SC.B.2.4.5 Physics I	Science, technology, and society	Demonstrate understanding of the interactions among science, technology, and society.	The student knows that each source of energy presents advantages and disadvantages to its use in society.	72 255 255 335	energy usage and conservation impact of generating electricity on the environment energy in the ocean using hybrid cars		
SC.C.1.4.1 Physics I	Force and motion	Demonstrate understanding of forces and motions	The student knows that all motion is relative to whatever frame of reference is chosen and that there is no absolute frame of reference from which to observe all motion.	17 17	comparing speeds nothing in the universe stays still	53 54	investigate frames of reference identify frame of reference

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SC.C.1.4.2 Physics I	Force and motion	Demonstrate understanding of forces and motions	The student knows that any change in velocity is an acceleration.	17	constant speed	11	compare and contrast speed and acceleration
				32	acceleration of sports cars	11	find acceleration of car
				32	acceleration defined	25	calculate acceleration of car
				33	calculating acceleration	28	calculate acceleration
				40	acceleration of falling objects	28	investigate acceleration on a ramp
				149	acceleration and circular motion		
SC.C.2.4.1 Physics I	Force and motion	Demonstrate understanding of forces and motions	The student knows that acceleration due to gravitational force is proportional to mass and inversely proportional to the square of the distance between the objects.	39	calculations pertaining to free fall	26	investigate projectile motion
				39	effect of gravity on motion		
				52	acceleration shown through strobe photography		
				88	work and gravity		
				137	projectile explained		
				138	free fall component of a trajectory		
				153	Newton's law of universal gravitation explained		
				402	gravitational field		

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SC.C.2.4.2 Physics I	Force and motion	Demonstrate understanding of forces and motions	The student knows that electrical forces exist between any two charged objects.	221	electromagnetic and strong force	40	find mass number of specific isotope
				340	understanding electric charge	72	investigate the nature of electric charge
				341	what causes shocks		
				341	charged objects and static electricity		
				354	understanding lightning		
SC.C.2.4.3 Physics I	Force and motion	Demonstrate understanding of forces and motions	The student describes how magnetic force and electrical force are two aspects of a single force.	342	electric forces are very strong	80	compare magnetic force and electric current in an electromagnet
				361	using magnetic forces	80	explore properties of electromagnets
				380	effect of current on a compass	81	find relationship between current and magnetic field
				404	the electric field	89	understand and investigate electric and gravitational fields
				522	electromagnetic waves		
SC.C.2.4.4 Physics I	Force and motion	Demonstrate understanding of forces and motions	The student knows that the forces that hold the nucleus of an atom together are much stronger than electromagnetic force and that this is the reason for the great amount of energy released from the nuclear reactions in the sun and other stars.	221	electromagnetic and strong force	40	find mass number of specific isotope

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SC.C.2.4.5 Physics I	Force and motion	Demonstrate understanding of forces and motions	The student knows that most observable forces can be traced to electric forces acting between atoms or molecules.	221	electromagnetic and strong force	40	find mass number of specific isotope
				340	understanding electric charge	72	investigate the nature of electric charge
				341	what causes shocks		
				341	charged objects and static electricity		
				342	electric forces are very strong		
				354	understanding lightning		
SC.C.2.4.6 Physics I	Force and motion	Demonstrate understanding of forces and motions	The student can explain that all forces come in pairs commonly called action and reaction.	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		
				158	Newton's third law and helicopters		

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SC.H.1.4.1 Physics I	Unifying concepts and processes of science	Demonstrate understanding of the unifying concepts and processes of science.	Know that investigations are conducted to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare different theories	4 8 23	what is an experiment designing experiments science helps us learn about natural world	47 94	design an experiment design pendulum experiments
SC.H.1.4.2 Physics I	Unifying concepts and processes of science	Demonstrate understanding of the unifying concepts and processes of science.	The student knows that from time to time, major shifts occur in the scientific view of how the world works, but that more often the changes that take place in the body of scientific knowledge are small modifications of prior knowledge.	28 224	Newton's idea of force development of periodic table	31	did result agree with hypothesis?

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SC.H.1.4.3 Physics I	Unifying concepts and processes of science	Demonstrate understanding of the unifying concepts and processes of science.	The student understands that no matter how well one theory fits observations, a new theory might fit them as well or better, or might fit a wider range of observations, because in science, the testing, revising, and occasional discarding ect.	10 what is a model	6 reflecting on the experiment 7 construct explanations supported by evidence 9 how do your observations support your answer? 11 what experimental data support answer? 47 construct a reasonable explanation 60 propose a relationship between power and voltage
SC.H.1.4.4 Physics I	Unifying concepts and processes of science	Demonstrate understanding of the unifying concepts and processes of science.	The student knows that scientists in any one research group tend to see things alike and that therefore scientific teams are expected to seek out the possible sources of bias in the design of their investigations and in their data analysis.	19 mathematical models 28 Newton's idea of force 224 development of periodic table	6 reflecting on the experiment 7 construct explanations supported by evidence 9 how do your observations support your answer? 11 what experimental data support answer? 47 construct a reasonable explanation 60 propose a relationship between power and voltage

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SC.H.1.4.5 Physics I	Unifying concepts and processes of science	Demonstrate understanding of the unifying concepts and processes of science.	The students understands that new ideas in science are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected finding, and usually grow slowly from many contributors.	11 11 22 23 186	importance of units communicating via measurement unexpected discoveries science is a creative enterprise creativity and discoveries of Charles Goodyear	67	explain what happened
SC.H.1.4.6 The Nature of Science	The student uses the scientific processes and habits of mind to solve problems.	10	The student understands that, in the short run, new ideas that do not mesh well with mainstream ideas in science often encounter vigorous criticism and that, in the long run, theories are judged by how they fit with other theories.	22 22 28 28 52 166 167 218 219 224	discovery of Penicillin Fleming's investigations Newton's idea of force 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 development of periodic table	6 7 9 11 47 60	reflecting on the experiment construct explanations supported by evidence how do your observations support your answer? what experimental data support answer? construct a reasonable explanation propose a relationship between power and voltage

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SC.H.1.4.7 Physics I	Unifying concepts and processes of science	Demonstrate understanding of the unifying concepts and processes of science.	The student understands the importance of a sense of responsibility, a commitment to peer review, truthful reporting of the methods and outcomes of investigations, and making the public aware of the findings.	11	importance of units	67	explain what happened
				11	communicating via measurement		

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SC.H.2.4.1 Physics I	Unifying concepts and processes of science	Demonstrate understanding of the unifying concepts and processes of science.	The student knows that scientists assume that the universe is a vast system in which basic rules exist that may range from very simple to extremely complex, but scientists operate on the belief that the rules can be discovered by careful, systemic study.	6	parts of a car and ramp system	5	investigate systems and change
				6	defining a system	7	collect precise data
				9	energy in a system	7	examine energy in the system
				9	stability of systems		
				10	an example system	22	investigate equilibrium
				10	car and ramp system	27	how can photogate ensure consistent results?
				23	science helps us learn about natural world	44	make a precise time measurement
				114	systems in equilibrium	78	estimate the precision of measurements
				128	equilibrium and architecture		
				240	system interactions		
				240	energy and systems		
				251	energy flow in natural systems		
				253	energy flow and food chains		
				423	restoring forces and equilibrium		
				423	equilibrium and harmonic motion		

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SC.H.2.4.2 Physics I	Unifying concepts and processes of science	Demonstrate understanding of the unifying concepts and processes of science.	The student knows that scientists control conditions in order to obtain evidence, but when that is not possible for practical or ethical reasons, they try to observe a wide range of natural occurrences to discern patterns.	6	what is a variable	6	recognize and control variables
				8	cause and effect relationships	27	identify and control variables
				8	control and experimental variables	94	investigate variables and how they affect the period of a pendulum
				8	dependent variables		
				8	independent variables		
				16	graphs and dependent variables		
				16	graphs and independent variables		
				23	science helps us learn about natural world		
				24	importance of changing one variable at a time in an experiment		

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SC.H.3.4.1 Physics I	Unifying concepts and processes of science	Demonstrate understanding of the unifying concepts and processes of science.	The student knows that performance testing is often conducted using small-scale models, computer simulations, or analogous systems to reduce the chance of system failure.	10	what is a model	4	construct a graph
				16	constructing graphs	11	create a graph
				16	steps to follow for graph construction	15	graph speed vs. height
				19	mathematical models	20	graph work done vs. deflection of rubber band
				25	constructing a graph	21	graph speed vs. rubber band deflection
				46	motion graphs	25	graph friction vs. mass
				48	motion graphs	27	graph launch angle vs. range
				112	using a graph to find force vector components	29	graph acceleration vs. steepness ratio
				419	harmonic motion graphs	45	make a graph of efficiency vs. speed
				420	finding the amplitude on a harmonic motion graph	50	graph time vs. temperature
						52	construct a graph
						75	graph current vs. time for the capacitor
						86	graph voltage vs. speed
						87	building different generators
						94	sketch harmonic motion graphs

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SC.H.3.4.2 Physics I	Science, technology, and society	Demonstrate understanding of the interactions among science, technology, and society.	The student knows that technological problems often create a demand for new scientific knowledge and that new technologies make it possible for scientists to extend their research in a way that advances science.	53 relationship between science and technology 78 rocket technology 79 new technologies 104 prosthetic legs and technology 122 maglev train technology 213 deep water submarine technology 235 technology and archaeology 273 how a smoke detector works 458 recording sound 532 applications of polarization	
SC.H.3.4.3 Physics I	Science, technology, and society	Demonstrate understanding of the interactions among science, technology, and society.	The student knows that scientists can bring information, insights, and analytical skills to matters of public concern and help people understand the possible causes and effects of events.	23 impact of medical breakthroughs	

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SC.H.3.4.4 Physics I	Science, technology, and society	Demonstrate understanding of the interactions among science, technology, and society.	The student knows that funds for science research come from federal government agencies, industry, and private foundations and that this funding often influences the areas of discovery.	53	relationship between science and technology	
				78	rocket technology	
				79	new technologies	
				104	prosthetic legs and technology	
				122	maglev train technology	
				213	deep water submarine technology	
				235	technology and archaeology	
				273	how a smoke detector works	
				458	recording sound	
				532	applications of polarization	

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SC.H.3.4.5 Physics I	Science, technology, and society	Demonstrate understanding of the interactions among science, technology, and society.	The student knows that the value of a technology may differ for different people and at different times.	53	relationship between science and technology		
				78	rocket technology		
				79	new technologies		
				104	prosthetic legs and technology		
				122	maglev train technology		
				213	deep water submarine technology		
				235	technology and archaeology		
				273	how a smoke detector works		
				458	recording sound		
				532	applications of polarization		
SC.H.3.4.6 Physics I	Science, technology, and society	Demonstrate understanding of the interactions among science, technology, and society.	The student knows that scientific knowledge is used by those who engage in design and technology to solve practical problems, taking human values and limitations into account.	105	engineering design cycle in action	47	suggest a design modification
						87	measure voltage for each different generator
						87	building different generators