

Correlation to Kentucky Core Content for Science
Foundations of Physical Science Student Text and Investigation Manual

Standard #: Subdomain	Section Title	Core Content	student text pg	detail	investigation pg	detail
SC-H-1.1.1 Physical Science	Structure of Atoms	Matter is made of minute particles called atoms, and atoms are composed of even smaller components. Each atom has a positively charged nucleus surrounded by negatively charged electrons. The electromagnetic force holds the atom together.	311 311 315 316 322 322 322 322 388	protons/neutrons/electrons location/size/charge of subatomic particles atomic number discussed mass number discussed atomic mass on the periodic table mass number on the periodic table atomic number on the periodic table chemical symbols and element names showing valence electrons in a diagram	133 133 133 133 133 136 136 137 140 140	identify element symbol and name identify atomic number identify mass number location of electrons in atom protons and neutrons atomic number mass number build atomic models find the number of electrons in outermost level review subatomic particles
SC-H-1.1.2 Physical Science	Structure of Atoms	The atom's nucleus is composed of protons and neutrons that are much more massive than electrons. When an element has atoms that differ in the number of neutrons, these atoms are called different isotopes of the element.	315 318	atoms of same element have same atomic number proton/electron attraction	132 136 137	building atom models model stable and neutral atoms importance of atomic number

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SC-H-1.1.3 Physical Science	Structure of Atoms	The forces that hold the nucleus together, at nuclear distances, are usually stronger than the forces that would make it fly apart. Fission is the splitting of a large nucleus into smaller pieces. Fusion is the joining of two nuclei.	387 389 389 389	fusion and fission explained forces in the nucleus electromagnetic force strong nuclear force	136 138	strong force fusion and fission
SC-H-1.2.1 Physical Science	Structure and Properties of Matter	Atoms interact with each other by transferring or sharing outermost electrons. These outer electrons govern the chemical properties of the element.	324 324 335	which element is more likely to combine with other elements? use the periodic table to predict chemical formulas chemical bonding and the periodic table	141	modeling a chemical bond

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SC-H-1.2.2 Physical Science	Structure and Properties of Matter	An element is composed of a single type of atom. When elements are listed according to the number of protons, repeating patterns of physical and chemical properties identify families of elements with similar properties.	321 329 330 332 335	groups of elements and valence shells periodic table columns and valence electrons bonding and periodic table position periodic table and electronegativities periodic table and oxidation numbers	141 142	build model of Na and Cl atoms and explain why they bond to form a molecule arrangement of electrons and groups of elements
SC-H-1.2.3 Physical Science	Structure and Properties of Matter	Bonds between atoms are created when outer electrons are paired by being transferred or shared. A compound is formed when two or more kinds of atoms bind together chemically.	278 343	compounds are composed of elements mole quantities	136 140 141 142 143 144	ions who do atoms form chemical bonds? whan an atom ionizes who do atoms combine in certain ratios? ionic compounds show ratios in which elements combine to form a compound

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SC-H-1.2.4 Physical Science	Structure and Properties of Matter	The physical properties of compounds reflect the nature of the interactions among molecules. These interactions are determined by the structure of the molecule including the constituent atoms.	330 331 332	ionic bonds covalent bonds distinguishing between ionic and covalent bonds	143	classify ionic compounds
SC-H-1.2.5 Physical Science	Structure and Properties of Matter	Solids, liquids, and gases differ in the distances between molecules or atoms and therefore the energy that binds them together.	284 285	states of matter and arrangement of molecules characteristics of matter related to its state	118 118 118 118	molecules in a liquid investigate melting think of melting process at molecular level observe melting process and study quantitatively

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SC-H-1.2.6 Physical Science	Structure and Properties of Matter	In conducting materials, electrons flow easily; whereas, in insulating materials, they can hardly flow at all. Semiconducting materials have intermediate behavior. At low temperatures, some materials become superconductors.	121	electrical conductivity explained	49	conductivity of aluminum vs. copper

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SC-H-1.3.1 Physical Science	Chemical Reactions	Chemical reactions occur all around us and in every cell in our bodies. These reactions may release or consume energy. Rates of chemical reactions vary. Reaction rates depend on concentration, temperature, and properties of reactants.	354	new substances are formed when a chemical change occurs	148	reactants and products
			357	combustion reaction	148	chemical equations
			359	balancing chemical equations	149	practice balancing equations
			361	heartburn reaction	152	write the balanced equation
			364	formation of petroleum is a very slow chemical reaction	152	predict how much product formed given the reactants
			381	exothermic reactions and MREs	156	predict products in a double displacement reaction
			382	endothermic reactions and cold packs	157	predict the products of double displacement reactions
					158	investigate energy changes in chemical reactions
					158	measure energy changes in 3 different reactions

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SC-H-1.4.1 Physical Science	Motion and Forces	Objects change their motion only when a net force is applied. Laws of motion are used to describe the effects of forces on the motion of objects.	14	Newton's third law summarized 45 how to calculate speed	8	calculating speed
			20	calculate speed of car	9	collect data and calculate speed of car
			20	find speed of bumblebee	10	calculate speed of the car
			24	accurate speed measurements	12	find speed of car at different positions
			29	position vs. time graph discussion	12	model the car's motion graphically
			32	average speed discussed	14	exploring acceleration on a ramp
			32	average speed vs. instantaneous	14	acceleration is the rate at which speed changes
			33	understanding acceleration	14	calculate speed of car at two places on the ramp
			36	examples of acceleration	15	changes in motion can be represented graphically
			37	speed vs. time graph discussion	16	2nd law
			42	calculate speed from distance/time graph	16	thinking about force
			45	Newton's second law summarized	16	unbalanced forces and acceleration of car
			45	Newton's first law summarized	17	calculate speed of car
			46	force has potential to change motion	19	find correct relationship between force mass and acceleration
			48	Newton's first law in detail	19	discover 2nd law of motion
			49	Newton's second law in detail	20	force and motion with car and ramp

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Standard #: Subdomain	Section Title	Core Content	student text pg	detail	investigation pg	detail
			49	force is related to acceleration	21	effect of friction on the car
			51	balanced and unbalanced forces	22	car and ramp and Newton's 3rd law
			56	friction explained	23	using 3rd law to explain common phenomena
			59	Newton's third law in detail	25	discover mechanical advantage of ropes and pulleys
			64	research effect of friction on human joints	27	set up a lever that has mechanical advantage
			64	solving problems using $f=ma$	36	find speed of marble
			69	how to calculate mechanical advantage		
			71	how a lever works		
			78	set up a lever with MA greater than 1		
			79	calculate mechanical advantage		
SC-H-1.4.2 Physical Science	Motion and Forces	Gravity is a universal force that each mass exerts on every other mass.	52	the effect of gravity	20	investigate effect of gravity on motion
			52	gravity depends on mass		
			54	Newton's law of universal gravitation		
			55	calculating gravitational force between objects		

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SC-H-1.4.3 Physical Science	Motion and Forces	The electric force is a universal force that exists between any two charged objects. Opposite charges attract while like charges repel.	105 106 107 108 108	charge is a fundamental property of matter static charge discussed explanation of coulomb how an electroscope works electroscopes	42	investigate electric charge
SC-H-1.4.4 Physical Science	Motion and Forces	Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. This idea underlies the operation of electric motors and generators.	164 166 166 168 170 171	what is an electromagnet? building an electromagnet increased current vs. strength of magnetic field how electric motors work dissecting an electric motor electromagnetic induction explained	66 67 68 73 73	build an electromagnet find out what happens to strength of electromagnet when current is increased investigate how an electric motor works use magnetic induction to create an electric field exploring electric generators

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SC-H-1.5.1 Physical Science	Conservation of Energy and Increase in Disorder	The total energy of the universe is constant. Energy can be transferred in many ways, but it can neither be created nor destroyed.	88 90 91 92 93 96	potential and kinetic energy explained conservation of energy explained energy conversions energy transformations and conservation different forms of energy described prove that energy is conserved	36 37 38 38 188	energy conservation and the roller coaster investigating conservation of energy with rollercoaster conservation of energy and energy transformations explore energy transformations specific heat and conservation of energy
SC-H-1.5.2 Physical Science	Conservation of Energy and Increase in Disorder	All energy can be considered to be either kinetic energy, potential energy, or energy contained by a field (e.g., electric, magnetic, gravitational).	91 91	following an energy transformation understand basic forms of energy	38 39	identify potential/kinetic energy conversions identify type of energy involved

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Standard #: Subdomain	Section Title	Core Content	student text pg	detail	investigation pg	detail
SC-H-1.5.3 Physical Science	Conservation of Energy and Increase in Disorder	Heat is the manifestation of the random motion and vibrations of atoms, molecules, and ions. The greater the atomic or molecular motion, the higher the temperature.	455	temperature and thermal energy and heat	119	investigate temperature and energy transfer in melting process
			468	heat transfer through air	182	relationship between heat and temperature
			468	densely packed solids are good conductors of heat	190	investigate conduction through all states of matter
			470	warming hands over candle	192	investigate convection in liquids
			470	convection currents and weather	194	investigate radiation emitted by solids
			472	convection currents in water	194	investigate radiation emitted by liquids
			476	solid road surface emits radiation		
			478	apply knowledge of heat transfer to different situations		
			481	global warming and heat transfer by radiation		

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SC-H-1.5.4 Physical Science	Conservation of Energy and Increase in Disorder	The universe becomes less orderly and less organized over time. For example, in the operation of mechanical systems, the useful energy output is always less than the energy input; the difference appears as heat.	84 85 85 92 96 97	work input and output some input work is converted to heat efficiency and bicycles where does "spent" energy go? explain the "lost" energy calculate work output from efficiency data	31 185	work output vs. work input find efficiency of water heater
SC-H-1.6.1 Physical Science	Interactions of Energy and Matter	Waves, including sound and seismic waves, waves on water, and electromagnetic waves, can transfer energy when they interact with matter. Apparent changes in frequency can provide information about relative motion.	195 221 222 222 474	waves transmit energy importance of wavelength of sound waves effect of medium on speed of sound wave effect of temperature on speed of sound wave energy and radiation relationships	83 86 94	find speed of a wave adjust frequency of a standing wave does sound behave like other waves?

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SC-H-1.6.2 Physical Science	Interactions of Energy and Matter	Electromagnetic waves, including radio waves, microwaves, infrared radiation, visible light, ultraviolet radiation, x-rays, and gamma rays, result when a charged object is accelerated.	196 237 237 237 237 250 272 474	waves are all around us microwave ovens radio and television signals visible light and the electromagnetic spectrum light waves and the electromagnetic spectrum identify uses of electromagnetic waves identify uses of electromagnetic waves ultraviolet and infrared light	134	investigating visible light with a spectrometer
SC-H-APP1 Physical Science	Applications/Connections	Students will apply scientific theory and conceptual understandings to solve problems of technological design and examine the interaction between science and technology.	73 74	relationship between science and technology sample engineering problem	70 70 70 71 71	designing and testing different electric motors proposing and comparing different electric motor designs using engineering design cycle did draining the batteries affect motor speed? which motor gave the highest speed and why?

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SC-H-APP2 Physical Science	Applications/Connections	Students will explore the impact of scientific knowledge and discoveries on personal and community health; recognize how science influences human population growth, use science to analyze the use of natural resources by an increasing human population; ...	73 391 391 395 400 444	impact of Da Vinci's work nuclear vs. fossil fuels impact of nuclear energy impact of industrial revolution reducing pollution impact of using fossil fuels	52	the cost of using electrical appliances
SC-H-APP3 Physical Science	Applications/Connections	investigate how science can be used to solve environmental quality problems, use science to investigate natural and human-induced hazards; analyze how science and technology are necessary but not sufficient for solving local, national, and global issues	379 379 379 395 400 444 448	research fuel cells research environmental impact of fuel cells hydrogen-powered cars and the environment fossil fuels problems caused by airborne pollutants acid rain explained research the issue of acid rain	163 163 178	research how trees offset accumulation of CO2 too much CO2 investigate effect of acid rain on microorganisms

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SC-H-APP4 Physical Science	Applications/Connections	Students will analyze the role science plays in everyday life and compare different careers in science; ...	58 78 120	Newton on a skateboard describe a problem that would be solved by an engineer circuits in your house	39 174 177	study energy transformations in daily life scenarios water quality testing chemistry and photography
SC-H-APP5 Physical Science	Applications/Connections	recognize that scientific knowledge comes from empirical standards, logical arguments, and skepticism, and is subject to change as new evidence becomes available;...			6 21 35 45 157	asking questions and learning about natural world construct reasonable explanation based on data study data and determine importance of height on speed of marble analyze data and explain a rule add new rules to list based on findings
SC-H-APP6 Physical Science	Applications/Connections	and investigate advances in science and technology that have important and long-lasting effects on science and society.	110 370 400 434 464	research Franklin's electricity experiments research Lavoisier's contributions research the Clean Air Act of 1970 and 1990 research local water supply history research the history of heat and temperature		

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SC-H-INQ1 Physical Science	Scientific Inquiry	Students will formulate testable hypotheses and demonstrate the logical connections between the scientific concepts guiding a hypothesis and the design of an experiment.			6	predict which car will move fastest
					7	perform your own experiment
					7	test the effect of one other variable
					10	conduct car/ramp experiment
					16	investigate Newton's 2nd law
					27	think about the variables
					34	investigate motion on a rollercoaster
					34	where does the marble move the fastest?
					43	how did A and B tapes acquire different charge?
					75	perform self-designed experiment
					75	investigate variables that affect the period of a pendulum
					151	explain how hypothesis compares to results
					151	perform the experiment you designed

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SC-H-INQ2 Physical Science	Scientific Inquiry	Students will use equipment, tools, techniques, technology, and mathematics to improve scientific investigations and communications.	24	making a graph		data tables and graphs can be created on computer or graphing calculator
			24	using an electronic timer		
			26	creating graphs		
			31	determining slope of a line	7	use a ruler to make a measurement
			38	determining slope of a line		
			41	make a graph	11	calculate % error
			42	interpreting distance/time graph	12	using photogates
					13	graph distance vs. time
					14	using photogates
					15	calculating acceleration from the slope of the line
					15	construct a quantitative graphical model
					16	use a force scale
					17	use photogates to study car on ramp
					18	use a balance to find mass of car
					21	think about percent change
					25	create a mathematical model
					27	find math rule for lever equilibrium
					28	derive a math formula
					30	use force scale

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Standard #: Subdomain	Section Title	Core Content	student text pg	detail	investigation pg	detail
					37	organize data into a graph of speed vs. height
					44	using electrical meter
					46	using electrical meter
					48	using electrical meter
					50	using electrical meter
					51	graph voltage vs. current
					76	calculate % error
					86	use CPO Timer to measure frequency
					107	study reflection of laser beam
					108	study refraction of laser beam
					113	trace critical angle with a laser beam
					121	graph mass vs. volume
					129	find average velocity
					147	organize observations into a category table
					158	use a thermometer
					167	average dissolving rate
					181	construct a graphical model
					183	construct a temperature vs. time graph

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SC-H-INQ3 Physical Science	Scientific Inquiry	Students will use evidence, logic, and scientific knowledge to develop and revise scientific explanations and models.	10	process of reviewing hypothesis explained	6	compare results with other groups
			19	which group did the best experiment?	11	graph speed vs. position
			20	how will speed change?	11	analyze speed change of car
			24	predicting speed from a graph	15	interpret a speed vs. time graph
			24	interpretations of patterns in data	18	evaluate graphs as to whether or not they show relationships between variables
			27	reading a graph		
			28	identifying cause and effect relationships	18	study data table for relationship between force and motion
			41	identify cause and effect		
			42	analyze a speed/distance graph	21	determine effect of increasing mass
			42	predict the speed of a car	21	evaluate percent change for data collected
			78	analyze lever diagram	21	construct reasonable explanation based on data
					25	analyze block and tackle data
					27	analyze lever equilibrium data
					35	study data and determine importance of height on speed of marble
					35	does data support hypothesis?

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					35	what evidence is there in support of your hypothesis?
					39	review energy theory in context of everyday scenarios
					39	critique group's explanation of energy transformations
					39	analyze energy transformations in different scenarios
					45	analyze data and explain a rule
					45	did battery voltage change?
					75	evaluate statistical significance
					76	use data to predict best string length for a pendulum clock
					76	analyze pendulum data
					77	show how energy loss data could be applied to designing a real clock
					77	compare law of conservation of energy to motion of pendulum
					121	use graph to predict mass of six objects

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Standard #: Subdomain	Section Title	Core Content	student text pg	detail	investigation pg	detail
					147	students analyze chemical change lab results
					151	review your hypothesis
					151	do the data support the hypothesis
					151	does your experiment agree with law of conservation of mass?
					156	make predictions about solubility
					157	add new rules to list based on findings
					167	evaluate method based on data
					167	did you prove or disprove your hypothesis?
					167	what was happening at molecular level?

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SC-H-INQ4 Physical Science	Scientific Inquiry	Students will design and conduct different kinds of scientific investigations	7	experimentation begins with a question	7	design your own experiment
			9	steps in the scientific method	7	perform your own experiment
			10	forming a hypothesis	7	doing a controlled experiment
			11	control and experimental variables	7	compare results with hypothesis
			19	design your own experiment	9	design three experiments using car and ramp
			19	design your own experiment	10	conduct car/ramp experiment
			26	independent and dependent variables	16	investigate Newton's 2nd law
			42	devise an experiment	16	decide how to vary the force on the car for this experiment
					21	choose independent and dependent variables for graph
					26	what variables can be changed?
		27	recognize variables			
		34	investigate motion on a rollercoaster			
		75	plan three experiments to determine which variable affects the period of a pendulum			

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					75	perform self-designed experiment
					75	design pendulum experiment
					93	decision trees and the advantage of doing multiple trials
					151	design experiment to find out if mass is conserved
					166	which factor will produce fastest dissolving rate?
					166	what three factors influence dissolving rate?

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SC-H-INQ5 Physical Science	Scientific Inquiry	Students will communicate and defend the designs, procedures, observations, and results of scientific investigations	20	explain your reasoning	9	present conclusions to the class
					9	reporting on an experiment
					37	describe the flow of energy based on experimental graph
					39	give a brief presentation to the class
					47	present and defend an explanation
					145	present findings and methods used
					145	present findings to the class
					151	present results to the class
					173	write praragraph to explain results
					175	create water quality report
					179	write summary of findings

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SC-H-INQ6 Physical Science	Scientific Inquiry	Students will review and analyze scientific investigations and explanations of other investigators, including peers.	10	process of reviewing hypothesis explained	35	what evidence is there in support of your hypothesis?
					39	critique group's explanation of energy transformations
					39	review energy theory in context of everyday scenarios
					39	analyze energy transformations in different scenarios
					77	show how energy loss data could be applied to designing a real clock
					77	compare law of conservation of energy to motion of pendulum
					151	review your hypothesis
					151	do the data support the hypothesis
					167	did you prove or disprove your hypothesis?
					167	what was happening at molecular level?