

**Correlation to South Carolina Science Academic Standards  
*Foundations of Physical Science with Earth and Space Science (2007)*  
 Student Text and Investigation Manual**

<b>Standard #: Course</b>	<b>Topic</b>	<b>Standard</b>	<b>Indicator</b>	<b>Volume 1 Student Text Page</b>		<b>Volume 2 Investigation Manual Page</b>	
PS-1.01 Physical Science	Scientific Inquiry	The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.	Generate hypotheses on the basis of credible, accurate, and relevant sources of scientific information.	9	steps in the scientific method	6	how do we ask questions and get answers from nature?
				10	forming a hypothesis	7	compare results with hypothesis
				10	the research question and hypothesis	75	plan three experiments to determine which variable affects the period of a pendulum
				19	design your own experiment	170	which factor will produce fastest dissolving rate?
				435	why haven't we run out of water	170	devise hypothesis and explain
				440	what is in your tap water	182	formulate hypothesis
				443	what is acid rain	208	formulate a hypothesis about why the seasons occur
				447	why are oceans salty	237	develop a research plan for studying volcanoes
				454	describe steps you would take to determine whether pH affects frog population		
				462	asking questions pertaining to specific heat and heat flow		
				478	why is Earth's atmosphere different from other planets		
				479	why do ears pop		
				498	why does Earth have seasons		
				507	how does rain form		
				515	how do animals survive in the desert		

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PS-1.02 Physical Science	Scientific Inquiry	The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.	Use appropriate laboratory apparatuses, technology, and techniques safely and accurately when conducting a scientific investigation.	24	using an electronic timer	7	use a ruler to make a measurement
				458	safety caution on heating jar	9	conduct three experiments with appropriate equipment
						10	selecting ramp and photogates
						12	select equipment and set up experiment
						12	using photogates
						14	using photogates
						16	use a force scale
						17	use photogates to study car on ramp
						18	use a balance to find mass of car
						20	safety tip for car/ramp setup
						24	ropes and pulley safety
						26	safety tip for hanging weights from lever
						30	rigging block and tackle
						30	use force scale
						40	electrical safety
						44	short circuit safety warning
						44	using electrical meter

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					46 using electrical meter
					48 using electrical meter
					50 using electrical meter
					56 short circuit safety warning
					58 short circuit safety warning
					145 carry out procedure and select equipment
					146 safety in the lab
					150 chemistry safety
					151 select materials from list
					158 wear goggles and apron
					168 safety equipment
					172 hot water safety
					180 safety tip for water testing
					182 safety tips for observing Daphnia
					186 thermometer safety
					188 heat safety
					192 heat safety
					202 safety in greenhouse gas investigation
					209 measuring the intensity of light using an electric meter and solar cell and light bulb

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					210 safety using light bulbs 216 safety in swinging thermometers 252 identifying the parts of a refracting telescope and making observations of the moon's surface 256 safety in lab

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PS-1.03 Physical Science	Scientific Inquiry	The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.	Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.	5	make measurements with precision	4	difference between precise and accurate data
				6	scientists use metric units	5	making measurements with precision
				12	importance of reliable and accurate data collection	6	electronic timer and release technique
				80	use and understand mass measurements	7	measure and record variables
				286	measuring volume of solids	7	record time interval
286	measuring volume of liquids	9	collect speed data				
						12	make metric length measurement
						16	understand and use units of force
						17	measure the force
						17	measure the force
						17	record times
						24	collect weight data
						25	measure and record the force
						30	measure height difference
						36	collect precise speed and height data
						36	make precise height measurements
						63	making measurements with precision

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					75 collect mass and amplitude data
					75 make precise length measurements
					116 measuring mass
					117 measuring volume
					171 collect time data and record observations
					176 measure pH
					182 making detailed observations
					184 collecting pH readings while adding carbon dioxide
					186 collecting temperature data
					189 collecting time and temperature data
					193 collecting and recording time and temperature data
					249 using your sundial to collect accurate data
					253 calibrating your telescope

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PS-1.04 Physical Science	Scientific Inquiry	The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.	Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.	7	experimentation begins with a question	7	design your own experiment
				11	control and experimental variables	7	doing a controlled experiment
				12	writing lab procedures	9	design three experiments and choose equipment
				19	design your own experiment	9	design three experiments and choose equipment
				26	independent and dependent variables	9	design three experiments using car and ramp
				42	devise an experiment	16	decide how to vary the force on the car for this experiment
				294	find the thickness of a single card	21	choose independent and dependent variables for graph
						26	what variables can be changed?
						27	recognize variables
						75	design pendulum experiment
		93	decision trees and the advantage of doing multiple trials				
		145	plan a procedure and select necessary equipment				
		151	design experiment to find out if mass is conserved				

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					151 plan procedures and select materials
					170 write a procedure
					170 what three factors influence dissolving rate?
					190 effect of changing mass on collected data
					194 design and construct an aneroid barometer
					196 writing a procedure for constructing a pointer for an aneroid barometer
					211 determining whether distance from light source or axial tilt plays a more significant role in causing the seasons
					214 develop a procedure to create an underwater spring
					233 identifying how the earthquake model represents an earthquake

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PS-1.05 Physical Science	Scientific Inquiry	The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.	Organize and interpret the data from a controlled scientific investigation by using mathematics (including formulas and dimensional analysis), graphs, models, and/or technology.	24	making a graph	6	compare results with other groups
				24	interpretations of patterns in data	9	construct a data table
				26	creating graphs	11	analyze speed change of car
				27	reading a graph	11	graph speed vs. position
				41	make a graph	12	understand and use data table
				42	interpreting distance/time graph	13	graph distance vs. time
				42	analyze a speed/distance graph	15	interpret a speed vs. time graph
				80	analyze lever diagram	15	construct a quantitative graphical model
				465	heat equation	17	record results in data table
				482	atmospheric pressure at various altitudes graph	18	organize different combinations of data
				651	inverse square law	18	study data table for relationship between force and motion
				651	apparent brightness vs. distance graph	24	use data table to record results
				657	use the diagram to answer the questions (#2)	25	create a mathematical model
				657	arrange the items in the table (#3)	25	analyze block and tackle data
				657	use the diagram to answer the questions (#4)	27	find math rule for lever equilibrium

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					27 analyze lever equilibrium data
					27 use data table to record results
					28 derive a math formula
					30 record ropes and pulley data in table
					35 does data support hypothesis?
					36 organize data into a table
					37 organize data into a graph of speed vs. height
					45 did battery voltage change?
					51 graph voltage vs. current
					75 create data table for self-designed experiment
					76 analyze pendulum data
					121 graph mass vs. volume
					147 organize observations into a category table
					147 students analyze chemical change lab results
					151 design a data table
					171 use data table for observations

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					181 organize water quality data into a table
					185 constructing a graph of drops of acid vs pH
					187 construct a graphical model
					187 find equation for trend line
					189 construct a temperature vs. time graph
					197 constructing a graph from atmospheric pressure data
					203 graphing water and ice temperature readings
					206 constructing a graph of time vs. temperature
					217 determining relationship between temperature of the atmosphere and relative humidity
					218 interpreting Doppler radar images
					237 finding a pattern of volcanoes on a bathymetric map
					257 inverse square law
					268 discovering the mathematical relationship between apparent brightness and distance

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PS-1.06 Physical Science	Scientific Inquiry	The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.	Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.	20	finding variability in data	18	use data to describe relationship between force and motion
				81	look at force data and decide the usefulness of a machine	19	use data to infer correct relationship between variables
						21	construct reasonable explanation based on data
						30	interpret block and tackle data
						35	study data and determine importance of height on speed of marble
						45	analyze data and explain a rule
						141	build models of Na and Cl and use them to explain bonding
						157	add new rules to list based on findings
						182	making hypotheses and testing them against observations
						185	analyzing the results of the buffered acid experiment
						193	explaining efficiency of heat transfer based on data
						197	evaluating your aneroid barometer design

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					224 reconstruct a series of events from clues  235 interpreting how the drumming affects the intensity of the earthquake in the model
PS-1.07 Physical Science	Scientific Inquiry	The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.	Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).	76 sample engineering problem	70 designing and testing different electric motors  70 proposing and comparing different electric motor designs  71 did draining the batteries affect motor speed?  71 which motor gave the highest speed and why?  194 design and construct an aneroid barometer

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PS-1.08 Physical Science	Scientific Inquiry	The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.	Compare the processes of scientific investigation and technological design.	75	relationship between science and technology	70	using engineering design cycle
				122	batteries, energy, and voltage		
				125	circuit breakers		
				126	ground fault circuit interrupter		
				131	how a light bulb works		
				171	how does an electric doorbell work?		
				247	how an LCD display works		
				252	how color printers work		
				254	how a color TV works		
				273	fiber optics		
				422	the science of scuba diving		
				439	the clean water act		
				445	catalytic converters and scrubbing reduce acid rain		
				489	hydrogen powered cars		
				536	using echo sounders to map the sea floor		
544	what we can learn from seismographs						
550	understanding earthquakes allows engineers to design safer buildings						

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				603 using satellite technology	
				605 space shuttle	

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PS-1.09 Physical Science	Scientific Inquiry	The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.	Use appropriate safety procedures when conducting investigations.	458 safety caution on heating jar	20 safety tip for car/ramp setup 24 ropes and pulley safety 26 safety tip for hanging weights from lever 40 electrical safety 44 short circuit safety warning 56 short circuit safety warning 58 short circuit safety warning 146 safety in the lab 150 chemistry safety 158 wear goggles and apron 168 safety equipment 172 hot water safety 180 safety tip for water testing 182 safety tips for observing Daphnia 186 thermometer safety 188 heat safety 192 heat safety 202 safety in greenhouse gas investigation 210 safety using light bulbs

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					216 safety in swinging thermometers 256 safety in lab
PS-2.01 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of the structure and properties of atoms.	Compare the subatomic particles (protons, neutrons, electrons) of an atom with regard to mass, location, and charge, and explain how these particles affect the properties of an atom (including identity, mass, volume, and reactivity).	317 location/size/charge of subatomic particles 317 protons/neutrons/electrons 321 atoms of same element have same atomic number 324 proton/electron attraction	132 atomic number determines what element that atom is 132 building atom models 133 protons and neutrons 133 location of electrons in atom 136 model stable and neutral atoms 137 importance of atomic number 137 build atomic models 140 review subatomic particles
PS-2.02 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of the structure and properties of atoms.	Illustrate the fact that the atoms of elements exist as stable or unstable isotopes.	322 isotopes explained 394 nuclear vs chemical reactions	133 exploring isotopes 136 understanding isotopes 138 nuclear reactions 160 how do you simulate nuclear decay?

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PS-2.03 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of the structure and properties of atoms.	Explain the trends of the periodic table based on the elements' valence electrons and atomic numbers.	327	groups of elements and valence shells	141	build model of Na and Cl atoms and explain why they bond to form a molecule
				335	periodic table columns and valence electrons		
				336	bonding and periodic table position		
				338	periodic table and electronegativities		
				341	periodic table and oxidation numbers		
PS-2.04 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of the structure and properties of atoms.	Use the atomic number and the mass number to calculate the number of protons, neutrons, and/or electrons for a given isotope of an element.	321	atomic number discussed	133	identify atomic number
				322	mass number discussed		
				322	isotopes explained		
				327	studying the periodic table		
				328	chemical symbols and element names		
				328	mass number on the periodic table		
				328	atomic mass on the periodic table		
				328	atomic number on the periodic table		
133	identify element symbol and name						
133	identify mass number						
133	exploring isotopes						
136	mass number						
136	atomic number						
136	building and studying the periodic table						
136	understanding isotopes						

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PS-2.05 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of the structure and properties of atoms.	Predict the charge that a representative element will acquire according to the arrangement of electrons in its outer energy level.	330	which element is more likely to combine with other elements?	136	ions
				330	use the periodic table to predict chemical formulas	141	modeling a chemical bond
				341	chemical bonding and the periodic table	141	when an atom ionizes
PS-2.06 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of the structure and properties of atoms.	Compare fission and fusion (including the basic processes and the fact that both fission and fusion convert a fraction of the mass of interacting particles into energy and release a great amount of energy).	393	fusion and fission explained	138	fusion and fission
				629	nuclear fusion and the sun		
PS-2.07 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of the structure and properties of atoms.	Explain the consequences that the use of nuclear applications (including medical technologies, nuclear power plants, and nuclear weapons) can have.	399	carbon dating	161	research pros and cons of uses for radioactive elements
				399	radioisotopes in science and medicine		
				406	research pros and cons of nuclear technology		

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PS-3.01 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of various properties and classifications of matter.	Distinguish chemical properties of matter (including reactivity) from physical properties of matter (including boiling point, freezing/melting point, density [with density calculations], solubility, viscosity, and conductivity).	359	physical and chemical changes and digestion	146	investigate and observe chemical and physical changes in the lab
				361	physical and chemical changes in tire recycling		
				378	determine if changes are chemical or physical		
PS-3.02 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of various properties and classifications of matter.	Infer the practical applications of organic and inorganic substances on the basis of their chemical and physical properties.	325	fireworks displays and electron excitation	134	using a spectrometer
				370	carbon chains	135	observing different light sources with a spectrometer
				400	photosynthesis and carbon reactions	148	chemical equations
				401	fossil fuels and carbon reactions	162	carbon reactions and the environment
				425	dissociation of water	162	importance of fossil fuels
						162	structure of fossil fuels
PS-3.03 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of various properties and classifications of matter.	Illustrate the difference between a molecule and an atom.	289	atoms and molecules	132	comparing atoms
				317	all matter is formed from atoms	141	compare and contrast elements and compounds
				317	all matter is formed from atoms		

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PS-3.04 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of various properties and classifications of matter.	Classify matter as a pure substance (either an element or a compound) or as a mixture (either homogeneous or heterogeneous) on the basis of its structure and/or composition.	284	mixtures can be separated by physical means	114	separating a homogeneous mixture
				289	atoms and molecules	141	compare and contrast elements and compounds
PS-3.05 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of various properties and classifications of matter.	Explain the effects of temperature, particle size, and agitation on the rate at which a solid dissolves in a liquid.			170	design experiments to explore dissolving rate
PS-3.06 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of various properties and classifications of matter.	Compare the properties of the four states of matter—solid, liquid, gas, and plasma—in terms of the arrangement and movement of particles.	290	states of matter and arrangement of molecules	118	observe melting process and study quantitatively
				291	characteristics of matter related to its state	118	molecules in a liquid
				411	molecular structure of ice	118	investigate melting
						118	think of melting process at molecular level
PS-3.07 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of various properties and classifications of matter.	Explain the processes of phase change in terms of temperature, heat transfer, and particle arrangement.	290	changes of state	119	create a temperature vs. time graph of phase change
				504	phases changes in the atmosphere	119	energy and phase changes
						204	compare the shape of the water line and the ice line on the temperature/time graph

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PS-3.08 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of various properties and classifications of matter.	Classify various solutions as acids or bases according to their physical properties, chemical properties (including neutralization and reaction with metals), generalized formulas, and pH (using pH meters, pH paper, and litmus paper).	423	define and compare acids and bases	176	investigate acids and bases
				423	properties of acids	176	measure pH of everyday solutions
				423	H and OH ions	181	testing pH of tap water samples
				423	acids and bases compared/contrasted	184	determining pH of water as carbon dioxide dissolves
				424	strong vs. weak acids		
				424	properties of bases		
				424	formulas and reactions of acids and bases		
				425	weak and strong acids and bases		
				425	strong vs. weak bases		
				426	pH and pH scale		
				426	defining and determining pH		
				426	concentration of hydronium ions determines pH and strength of acids and bases		
				427	pH of substances you use or consume		
				427	table of pH of common substances		
				428	pH and blood		
				428	examples of acid and base chemistry		

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				443 pH of acid rain 443 concentration of ions and pH	
PS-4.01 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.	Explain the role of bonding in achieving chemical stability.	330 which element is more likely to combine with other elements? 330 use the periodic table to predict chemical formulas 341 chemical bonding and the periodic table	141 modeling a chemical bond 143 ionic compounds
PS-4.02 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.	Explain how the process of covalent bonding provides chemical stability through the sharing of electrons.	337 covalent bonding 346 covalent compounds	143 ionic compounds
PS-4.03 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.	Illustrate the fact that ions attract ions of opposite charge from all directions and form crystal lattices.	337 ionic bonds 337 ionic bonds in a salt crystal 338 formation of an ionic bond 340 ionic compounds	143 ionic compounds

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PS-4.04 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.	Classify compounds as crystalline (containing ionic bonds) or molecular (containing covalent bonds) based on whether their outer electrons are transferred or shared.	336 337 338 415 416	ionic bonds covalent bonds distinguishing between ionic and covalent bonds dissolving an ionic compound solute dissolution depends on chemical bonds	143	classify ionic compounds
PS-4.05 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.	Predict the ratio by which the representative elements combine to form binary ionic compounds, and represent that ratio in a chemical formula.	342 344 345	writing a chemical formula summary of chemical formula writing rules naming compounds	143 143 145	name chemical compounds predict chemical formulas determine empirical formula
PS-4.06 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.	Distinguish between chemical changes (including the formation of gas or reactivity with acids) and physical changes (including changes in size, shape, color, and/or phase).	359 361 378	physical and chemical changes and digestion physical and chemical changes in tire recycling determine if changes are chemical or physical	146	investigate and observe chemical and physical changes in the lab

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PS-4.07 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.	Summarize characteristics of balanced chemical equations (including conservation of mass and changes in energy in the form of heat—that is, exothermic or endothermic reactions).	369	history of law of conservation of mass	149	balance these equations
				377	which of the equations is balanced?	150	investigate conservation of mass in effervescent tablet reaction
						158	measure energy changes in 3 different reactions

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PS-4.08 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.	Summarize evidence (including the evolution of gas; the formation of a precipitate; and/or changes in temperature, color, and/or odor) that a chemical reaction has occurred.	359	physical and chemical changes and digestion	146	investigate and observe chemical and physical changes in the lab
				360	new substances are formed when a chemical change occurs	148	reactants and products
				361	physical and chemical changes in tire recycling	148	chemical equations
				365	balancing chemical equations	149	practice balancing equations
				367	chemical reactions in living systems	152	predict how much product formed given the reactants
				378	determine if changes are chemical or physical	152	write the balanced equation
				384	consumer chemistry	162	investigating combustion reactions
				384	combustion reactions		
				387	MRE ration heater reaction		
				401	chemistry of the atmosphere		
				401	chemistry of the atmosphere		
				403	carbon reactions		
				425	dissociation of water		
				444	chemical reactions and the formation of acid rain		

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PS-4.09 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.	Apply a procedure to balance equations for a simple synthesis or decomposition reaction.	377 which of the equations is balanced?	149 balance these equations
PS-4.10 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.	Recognize simple chemical equations (including single replacement and double replacement) as being balanced or not balanced.	377 which of the equations is balanced? 381 synthesis or addition reactions 382 decomposition reactions 383 single displacement reactions 383 double displacement reactions	149 balance these equations 156 investigate double displacement reactions
PS-4.11 Physical Science	Chemistry: Structure and Properties of Matter	The student will demonstrate an understanding of chemical reactions and the classifications, structures, and properties of chemical compounds.	Explain the effects of temperature, concentration, surface area, and the presence of a catalyst on reaction rates.	370 formation of petroleum is a very slow chemical reaction 428 acids and bases and enzymes in digestion	156 predict products in a double displacement reaction

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PS-5.01 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature of forces and motion.	Explain the relationship among distance, time, direction, and the velocity of an object.	13	speed is relative	8	calculating speed
				14	how to calculate speed	9	collect data and calculate speed of car
				15	compare and contrast speed and velocity	10	calculate speed of the car
				18	what is the speed of an object that is standing still?	12	find speed of car at different positions
				20	find speed of bumblebee	13	make a position vs. time graph
				20	calculate speed of car	14	calculate speed of car at two places on the ramp
				24	accurate speed measurements	15	make a speed vs. time graph
				25	conceptual models of motion	17	caclulate speed of car
				30	position vs. time graphs	36	find speed of marble
				32	average speed vs. instantaneous		
				32	average speed discussed		
				37	speed vs. time graphs		
				42	calculate speed from distance/time graph		

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PS-5.02 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature of forces and motion.	Use the formula $v = d/t$ to solve problems related to average speed or velocity.	14	how to calculate speed	8	calculating speed
				15	compare and contrast speed and velocity	9	collect data and calculate speed of car
				20	find speed of bumblebee	10	calculate speed of the car
				20	calculate speed of car	12	find speed of car at different positions
				24	accurate speed measurements	14	calculate speed of car at two places on the ramp
				32	average speed vs. instantaneous	17	caclulate speed of car
				32	average speed discussed	36	find speed of marble
				42	calculate speed from distance/time graph		
PS-5.03 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature of forces and motion.	Explain how changes in velocity and time affect the acceleration of an object.	33	understanding acceleration	12	calculate speed of moving car
				36	examples of acceleration	14	acceleration is the rate at which speed changes
PS-5.04 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature of forces and motion.	Use the formula $a = (vf-vi)/t$ to determine the acceleration of an object.	33	understanding acceleration	14	calculate acceleration of car on ramp
				35	how to calculate acceleration	17	explore 2nd law and acceleration
				36	examples of acceleration		
				41	find acceleration of car		
				49	link between force and acceleration		
				53	acceleration due to gravity		

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PS-5.05 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature of forces and motion.	Explain how acceleration due to gravity affects the velocity of an object as it falls.	52	the effect of gravity	20	investigate effect of gravity on motion
PS-5.06 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature of forces and motion.	Represent the linear motion of objects on distance-time graphs.	30	position vs. time graphs	13	make a position vs. time graph
PS-5.07 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature of forces and motion.	Explain the motion of objects on the basis of Newton's three laws of motion: inertia; the relationship among force, mass, and acceleration; and action and reaction forces.	45	Newton's third law summarized	14	exploring acceleration on a ramp
				45	Newton's second law summarized	16	thinking about force
				45	Newton's first law summarized	19	discover 2nd law of motion
				48	Newton's first law in detail	22	car and ramp and Newton's 3rd law
				49	Newton's second law in detail	23	using 3rd law to explain common phenomena
				59	Newton's third law in detail		
				64	solving problems using $f=ma$		
PS-5.08 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature of forces and motion.	Use the formula $F = ma$ to solve problems related to force.	64	solving problems using $f=ma$	19	discover 2nd law of motion

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PS-5.09 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature of forces and motion.	Explain the relationship between mass and weight by using the formula $FW = mag.$	47 53	weight vs. mass how to calculate weight	20	weight vs. mass
PS-5.10 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature of forces and motion.	Explain how the gravitational force between two objects is affected by the mass of each object and the distance between them.	52 54 55 612	gravity depends on mass Newton's law of universal gravitation calculating gravitational force between objects Newton's law of universal gravitation	257	relating the relationship between orbital speed and distance to the equation of universal gravitation

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PS-6.01 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature, conservation, and transformation of energy.	Explain how the law of conservation of energy applies to the transformation of various forms of energy (including mechanical energy, electrical energy, chemical energy, light energy, sound energy, and thermal energy).	89	energy conservation and earth systems	37	investigating conservation of energy with rollercoaster
				89	efficiency and energy transfer in natural systems		
				90	energy conservation and efficiency in biological systems		
				92	potential and kinetic energy explained		
				94	conservation of energy explained		
				95	understand basic forms of energy		
				95	energy conversions		
				96	energy transformations and conservation		
				97	different forms of energy described		
				100	energy conservation and swimming		
PS-6.02 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature, conservation, and transformation of energy.	Explain the factors that determine potential and kinetic energy and the transformation of one to the other.	95	following an energy transformation	38	identify potential/kinetic energy conversions
				543	potential energy transformed to kinetic energy causes earthquakes		

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PS-6.03 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature, conservation, and transformation of energy.	Explain work in terms of the relationship among the force applied to an object, the displacement of the object, and the energy transferred to the object.	86	work input and output	31	work output vs. work input
				91	concept of energy as stored work	31	work = force X distance
				102	decide whether or not work is done		
PS-6.04 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature, conservation, and transformation of energy.	Use the formula $W = Fd$ to solve problems related to work done on an object.	85	how to calculate work	31	work = force X distance
				102	decide whether or not work is done	31	calculate work done on block
				102	calculate work done	191	calculating work input and work output
				103	calculate work accomplished by a motor		
				103	compare different amounts of work done		
PS-6.05 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature, conservation, and transformation of energy.	Explain how objects can acquire a static electric charge through friction, induction, and conduction.	111	charge is a fundamental property of matter	42	investigate electric charge
				112	static charge discussed	73	use magnetic induction to create an electric field
				113	explanation of coulomb	73	exploring electric generators
				114	how an electroscope works		
				114	electroscopes		
				177	electromagnetic induction explained		

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PS-6.06 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature, conservation, and transformation of energy.	Explain the relationships among voltage, resistance, and current in Ohm's law.	107	concept of electric current	44	investigate concept of voltage
				120	voltage and potential energy	46	investigate concept of electric current
				121	how to measure voltage	48	measuring resistance
				123	electrical current explained	50	Ohm's law
				125	how to measure current		
				129	understand the concept of electrical resistance		
				135	Ohm's law explained		
				138	using Ohm's law to analyze circuits		
				141	potentiometer explained		
PS-6.07 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature, conservation, and transformation of energy.	Use the formula $V = IR$ to solve problems related to electric circuits.	135	Ohm's law explained	50	Ohm's law
				138	using Ohm's law to analyze circuits		
PS-6.08 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature, conservation, and transformation of energy.	Represent an electric circuit by drawing a circuit diagram that includes the symbols for a resistor, switch, and voltage source.	108	concept of electric circuits	45	battery chemicals and electrical charge
				109	circuit diagrams		
				119	battery uses chemical energy to produce electrical charge		

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PS-6.09 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature, conservation, and transformation of energy.	Compare the functioning of simple series and parallel electrical circuits.	151	single path vs. branching paths	56	build a parallel circuit
				151	holiday lights as series or parallel	56	build a series circuit
				151	parallel circuit defined	57	compare brightness of bulbs in series vs. parallel
				151	series circuit defined	58	build a series circuit and find total resistance
				152	household wiring	60	parallel circuit and Ohm's law
				153	current and voltage in series circuits	61	compare current and voltage and resistance in each type of circuit
				157	voltage and resistance in parallel circuits		
				161	analyze a parallel circuit		
				162	analyze a series circuit		
PS-6.10 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature, conservation, and transformation of energy.	Compare alternating current (AC) and direct current (DC) in terms of the production of electricity and the direction of current flow.	126	alternating current		
				126	direct current		
PS-6.11 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature, conservation, and transformation of energy.	Explain the relationship of magnetism to the movement of electric charges in electromagnets, simple motors, and generators.	170	what is an electromagnet?	66	build an electromagnet
				172	building an electromagnet	67	find out what happens to strength of electromagnet when current is increased
				172	increased current vs. strength of magnetic field		
				174	how electric motors work	68	investigate how an electric motor works
				176	dissecting an electric motor		

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PS-7.01 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature and properties of mechanical and electromagnetic waves.	Illustrate ways that the energy of waves is transferred by interaction with matter (including transverse and longitudinal/compressional waves).	201 486 544 632	waves transmit energy energy and radiation relationships body waves the sun's energy reaches Earth in the form of electromagnetic waves		
PS-7.02 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature and properties of mechanical and electromagnetic waves.	Compare the nature and properties of transverse and longitudinal/compressional mechanical waves.	202 203 204 211 221 228 228 243 243 248 256 278 544	waves are all around us transverse and longitudinal waves frequency and wavelength and amplitude standing waves on a string properties of sound waves effect of temperature on speed of sound wave effect of medium on speed of sound wave microwave ovens radio and television signals properties of light waves identify uses of electromagnetic waves identify uses of electromagnetic waves body waves	82 83 84 86 94	study wave pulses on elastic cord measure speed of a wave pulse make different types of waves in a ripple tank investigate frequency and wavelength does sound behave like other waves?

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PS-7.03 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature and properties of mechanical and electromagnetic waves.	Summarize characteristics of waves (including displacement, frequency, period, amplitude, wavelength, and velocity as well as the relationships among these characteristics).	185	what is a cycle?	75	investigate variable that affect the period of a pendulum
				188	concept of frequency explained	75	analyze pendulum data
				188	concept of period explained	83	find speed of a wave
				198	analyze systems to find cycle/period/frequency	86	adjust frequency of a standing wave
				225	frequency of sound and pitch	90	what is sound and how do we hear it?
				227	importance of wavelength of sound waves		
PS-7.04 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature and properties of mechanical and electromagnetic waves.	Use the formulas $v = f \lambda$ and $v = d/t$ to solve problems related to the velocity of waves.	227	importance of wavelength of sound waves	83	find speed of a wave
						86	adjust frequency of a standing wave

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PS-7.05 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature and properties of mechanical and electromagnetic waves.	Summarize the characteristics of the electromagnetic spectrum (including range of wavelengths, frequency, energy, and propagation without a medium).	202	waves are all around us	105	explore relationship between color and wavelength
				243	visible light and the electromagnetic spectrum	134	investigating visible light with a spectrometer
				243	microwave ovens	265	an element's spectral lines correspond to specific wavelengths of light
				243	radio and television signals		
				248	color and frequency of light waves		
				256	identify uses of electromagnetic waves		
				278	identify uses of electromagnetic waves		

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PS-7.06 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature and properties of mechanical and electromagnetic waves.	Summarize reflection and interference of both sound and light waves and the refraction and diffraction of light waves.	207	waves and refraction	85	observing reflection in water waves
				207	waves and reflection	95	interference and sound waves
				207	reflection in water waves and light waves	95	investigate interference with sound waves
				207	waves and absorption	101	examine light through diffraction grating
				208	refraction and eyeglasses	106	tracing incident and reflected rays
				212	constructive and destructive interference	106	investigate reflection of light
				216	can wave interference sink a ship?	107	investigate how light interacts with mirrors
				229	interference of sound waves	107	plot reflected rays from a mirror
				231	consonance and dissonance and beats	108	explore refraction with a prism
				264	refraction in optical systems	108	tracing incident and refracted rays
				264	forming images with lenses	108	explore refraction with lenses
				266	reflection and mirrors	108	investigate how light interacts with a prism
				267	refraction and lenses	110	finding focal point and focal length of a lens
				269	index of refraction	111	plotting images formed when light is refracted by a lens
				279	find the angle of reflection		
				486	absorption and emission		

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						253	using a retractive telescope
PS-7.07 Physical Science	Physics: The Interactions of Matter and Energy	The student will demonstrate an understanding of the nature and properties of mechanical and electromagnetic waves.	Explain the Doppler effect conceptually in terms of the frequency of the waves and the pitch of the sound.	225	frequency of sound and pitch	90	what is sound and how do we hear it?
				654	the Doppler effect		