

Correlation to Tennessee Physical Science Learning Expectations
Foundations of Physical Science Student Text and Investigation Manual

Standard #: Course	Topic	Standard	Learning Expectations	Volume 1 Student Text page	Volume 2 Investigation Manual page
INQ1.1 Physical Science	Processes of Science	To enable students to apply the processes of science by posing questions and investigating phenomena through the language, methods, and instruments of science	Observing - Senses are used to develop an awareness of events or objects and their properties	372 observe chemical changes	100 observe glow-in-the-dark paper 146 observe evidence of chemical change 158 observe temperature changes in chemical reactions 164 observe Tyndall effect 168 observe dissolving process 175 make observations about local surface water 192 observe convection currents
INQ1.2 Physical Science	Processes of Science	To enable students to apply the processes of science by posing questions and investigating phenomena through the language, methods, and instruments of science	Questioning - Development of an inquisitive mind and the effective use of questioning techniques furthers the acquisition of information	10 the research question and hypothesis	6 formulate hypothesis 6 how do we ask questions and get answers from nature? 9 devise a hypothesis 34 formulate hypothesis 166 devise hypothesis and explain 178 formulate hypothesis 198 formulate hypothesis

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INQ1.3 Physical Science	Processes of Science	To enable students to apply the processes of science by posing questions and investigating phenomena through the language, methods, and instruments of science	Collecting Data - Acquiring, recording, arranging and storing of information must be performed in a complete, accurate, concise, and user-friendly manner	5 12	measuring distance importance of reliable and accurate data collection data tables and graphs can be created on computer or graphing calculator 4 difference between precise and accurate data 5 measuring metric and english lengths 6 measure time 6 electronic timer and release technique 7 record time interval 9 collect speed data 9 construct a data table 12 understand and use data table 14 record three different time intervals 16 measure force 17 record results in data table 17 record times 18 organize different combinations of data 24 collect weight data 24 use data table to record results 25 collect force data

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					27 write down the number of weights you use
					27 use data table to record results
					30 record ropes and pulley data in table
					36 collect precise speed and height data
					36 organize data into a table
					44 measure voltage
					46 measure current
					48 measure resistance
					75 create data table for self-designed experiment
					75 collect mass and amplitude data
					87 measure wavelength
					116 measure mass
					117 measure volume
					146 record detailed observations
					150 record data as you perform experiment
					151 design a data table
					167 collect time data and record observations

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Standard #: Course	Topic	Standard	Learning Expectations	Volume 1 Student Text page	Volume 2 Investigation Manual page
					167 use data table for observations 173 organize water quality data into a table 180 measure temperature

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INQ1.4 Physical Science	Processes of Science	To enable students to apply the processes of science by posing questions and investigating phenomena through the language, methods, and instruments of science	Analyzing - Data should be examined to find patterns that may suggest cause and effect relationships or support inferences and hypotheses	24 making a graph 24 interpretations of patterns in data 26 drawing a best fit curve 26 creating graphs 27 reading a graph 41 make a graph 42 analyze a speed/distance graph 78 analyze lever diagram	6 compare results with other groups 11 calculate % error 11 analyze speed change of car 11 graph speed vs. position 11 draw best fit curve 13 draw best fit curve 13 graph distance vs. time 15 construct a quantitative graphical model 15 interpret a speed vs. time graph 18 study data table for relationship between force and motion 21 think about percent change 25 analyze block and tackle data 27 analyze lever equilibrium data 35 does data support hypothesis? 37 organize data into a graph of speed vs. height 45 did battery voltage change?

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Standard #: Course	Topic	Standard	Learning Expectations	Volume 1 Student Text page	Volume 2 Investigation Manual page
					51 graph voltage vs. current 76 analyze pendulum data 76 calculate % error 121 graph mass vs. volume 129 find average velocity 147 students analyze chemical change lab results 147 organize observations into a category table 167 average dissolving rate 181 construct a graphical model 183 construct a temperature vs. time graph
INQ1.5 Physical Science	Processes of Science	To enable students to apply the processes of science by posing questions and investigating phenomena through the language, methods, and instruments of science	Explaining - Phenomena and related information are made understandable through discussion that culminates in a higher level of learning		15 discuss and test ideas with your group 19 explain how you arrived at your answer 29 discuss what you learned about gears 47 discuss an explanation with your group 129 explain your answer and justify

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INQ1.6 Physical Science	Processes of Science	To enable students to apply the processes of science by posing questions and investigating phenomena through the language, methods, and instruments of science	Communicating - Essential to science is the act of accurately and effectively conveying oral, written, graphic, or electronic information	12 writing lab procedures 20 explain your reasoning	vocabulary is presented in context of investigations students are encouraged to keep a lab notebook 9 reporting on an experiment 9 present conclusions to the class 21 construct reasonable explanation based on data 35 study data and determine importance of height on speed of marble 37 describe the flow of energy based on experimental graph 39 give a brief presentation to the class 41 drawing and interpreting circuit diagrams 45 analyze data and explain a rule 47 present and defend an explanation 145 present findings and methods used 145 present findings to the class 151 present results to the class

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Standard #: Course	Topic	Standard	Learning Expectations	Volume 1 Student Text page	Volume 2 Investigation Manual page
					151 write a procedure 166 write a procedure 173 write paragraph to explain results 175 create water quality report 179 write summary of findings
INQ2.1 Physical Science	Unifying Concepts of Science	To enable students to acquire and integrate scientific knowledge by applying major concepts, theories, principles, and laws from the life, environmental, physical, and earth and space sciences	Scale and Models - Models provide a conceptual bridge between the concrete and the abstract, while the application of scale allows for understanding the difference in magnitude between the model and the target item	23 why make models? 24 scientific models 24 what is a scientific model? 42 interpreting distance/time graph	25 create a mathematical model 27 find math rule for lever equilibrium 28 derive a math formula 151 does your experiment agree with law of conservation of mass?

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INQ2.2 Physical Science	Unifying Concepts of Science	To enable students to acquire and integrate scientific knowledge by applying major concepts, theories, principles, and laws from the life, environmental, physical, and earth and space sciences	Form and Function - Form is linked to the function of materials and systems, and function may alter form	80 form and function of wheelbarrow sailboat human jaw	68 form and function of different electric motor configurations 108 form and function of human eye, prism, and lenses
INQ2.3 Physical Science	Unifying Concepts of Science	To enable students to acquire and integrate scientific knowledge by applying major concepts, theories, principles, and laws from the life, environmental, physical, and earth and space sciences	Organization - Everything is organized into related systems or subsystems	180 harmonic motion in natural systems 258 optical systems 278 system of classifying matter 409 a solute and a solvent make up a system	

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INQ2.4 Physical Science	Unifying Concepts of Science	To enable students to acquire and integrate scientific knowledge by applying major concepts, theories, principles, and laws from the life, environmental, physical, and earth and space sciences	Interactions - Within all living and non-living systems, matter and energy interact	389 atoms and nuclear energy	84 waves in motion 158 energy in chemical reactions 198 food energy
INQ2.5 Physical Science	Unifying Concepts of Science	To enable students to acquire and integrate scientific knowledge by applying major concepts, theories, principles, and laws from the life, environmental, physical, and earth and space sciences	Change - Interactions within and among systems result in changes in their properties, position, movement, form, or function	59 equilibrium/action reaction 164 electromagnets reverse current and switch polarity 261 change in optical systems	87 changing frequency in standing waves

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INQ2.6 Physical Science	Unifying Concepts of Science	To enable students to acquire and integrate scientific knowledge by applying major concepts, theories, principles, and laws from the life, environmental, physical, and earth and space sciences	Conservation - In any natural system, form may change but nothing is lost	60	conservation of momentum	36	investigate energy conservation
				90	conservation of energy	150	investigate conservation of mass
				363	conservation of mass		
				363	conservation of mass		

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INQ3.1 Physical Science	Habits of Mind	To enable students to think and act in a manner consistent with the practice and the nature of science; and exhibit an awareness of the historical and cultural contributions of science	Historical and Cultural Perspective - Scientific understanding evolves over time as an approximation of truth and within a cultural context	34	Newton and the history of physics
				45	Newton's Principia
				45	Newton's discovery of the 2nd law
				46	oldest known standard weight
				55	Newton and the apple legend
				73	Leonardo DaVinci
				86	James Watt
				110	research Franklin's electricity experiments
				115	Volta's batteries
				131	Georg Ohm's work with circuits
				134	history of superconductivity
				160	Faraday's contributions
				161	history of magnetism
				312	contributions of Fermi
				312	Dalton's contributions
312	history of atomic theory				
320	the quests of alchemists				
321	Mendeleev's periodic table				
321	contributions of Mendeleev				

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				332	
					Linus Pauling and electronegativities
				343	Avogadro's number
				363	history of law of conservation of mass
				363	Antoine Lavoisier
				370	research Lavoisier's contributions
				391	scientific discovery and the atomic age
				393	Marie and Pierre Curie
				393	accomplishments of Marie Curie
				393	contributions of Marie and Pierre Curie
				393	history of nuclear chemistry
				395	impact of industrial revolution
				400	research the Clean Air Act of 1970 and 1990
				434	research local water supply history
				456	contributions of Joule
				464	research the history of heat and temperature

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INQ3.2 Physical Science	Habits of Mind	To enable students to think and act in a manner consistent with the practice and the nature of science; and exhibit an awareness of the historical and cultural contributions of science	Assumption - Establishing the validity of an argument through data and differentiating between fact and assumption are vital parts of the scientific process	10 process of reviewing hypothesis explained	21 construct reasonable explanation based on data 35 what evidence is there in support of your hypothesis? 35 study data and determine importance of height on speed of marble 39 critique group's explanation of energy transformations 39 review energy theory in context of everyday scenarios 39 analyze energy transformations in different scenarios 45 analyze data and explain a rule 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 163 evaluating choice of favorite car

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Standard #: Course	Topic	Standard	Learning Expectations	Volume 1 Student Text page	Volume 2 Investigation Manual page
					167 did you prove or disprove your hypothesis? 167 what was happening at molecular level?
INQ3.3 Physical Science	Habits of Mind	To enable students to think and act in a manner consistent with the practice and the nature of science; and exhibit an awareness of the historical and cultural contributions of science	Estimation and Computation - Scientists evaluate the level of precision needed to make a reasonable response and perform necessary calculations	12 importance of reliable and accurate data collection	4 difference between precise and accurate data 6 electronic timer and release technique 7 record time interval 9 collect speed data 17 record times 24 collect weight data 36 collect precise speed and height data 75 collect mass and amplitude data 167 collect time data and record observations

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INQ3.4 Physical Science	Habits of Mind	To enable students to think and act in a manner consistent with the practice and the nature of science; and exhibit an awareness of the historical and cultural contributions of science	Methods - Scientists use a variety of techniques to describe and solve problems	11	control and experimental variables	6	formulate hypothesis
				12	writing lab procedures	6	asking questions and learning about natural world
				26	independent and dependent variables	7	doing a controlled experiment
				28	identifying cause and effect relationships	7	variables in an experiment
				41	identify cause and effect	9	devise a hypothesis
						21	determine effect of increasing mass
						21	choose independent and dependent variables for graph
						27	recognize variables
						34	formulate hypothesis
						151	write a procedure
						166	devise hypothesis and explain
						166	write a procedure
						178	formulate hypothesis
						198	formulate hypothesis

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INQ3.5 Physical Science	Habits of Mind	To enable students to think and act in a manner consistent with the practice and the nature of science; and exhibit an awareness of the historical and cultural contributions of science	Science and Technology - Science and technology are separate but interdependent	73 relationship between science and technology 74 sample engineering problem	70 using engineering design cycle
INQ3.6 Physical Science	Habits of Mind	To enable students to think and act in a manner consistent with the practice and the nature of science; and exhibit an awareness of the historical and cultural contributions of science	Creative Enterprise - Ideas and inventions contribute to the creative expression of science	7 experimentation begins with a question 19 design your own experiment 42 devise an experiment	7 design your own experiment 9 design three experiments using car and ramp 16 decide how to vary the force on the car for this experiment 26 what variables can be changed? 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 what three factors influence dissolving rate?

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INQ4.1 Physical Science	Science in Society	To enable students to demonstrate positive attitudes toward science necessary for solving problems and making personal decisions about issues that affect individuals, society, and the environment	Attitudes - Scientific progress and the attitudes of society influence one another	12	scientific results must be repeatable	14	multiple trials
				12	multiple experiment trials	63	perform multiple trials and average the results
				34	Newton's research impacted mathematics	163	research how trees offset accumulation of CO2
				73	impact of technology		
				73	impact of Da Vinci's work		
				379	research fuel cells		
				379	research environmental impact of fuel cells		
				400	problems caused by airborne pollutants		
INQ4.2 Physical Science	Science in Society	To enable students to demonstrate positive attitudes toward science necessary for solving problems and making personal decisions about issues that affect individuals, society, and the environment	Personal Goals - Applications of science can affect the quality of life for individuals	214	ultrasound technology	163	too much CO2
				220	voice recognition technology	163	consider a vehicle's fuel economy
				294	invention of Kevlar	163	can trees compensate for manmade CO2 from vehicles and industry?
				364	petroleum		
				379	hydrogen-powered cars and the environment	172	save water for houseplants
				395	fossil fuels	172	perform water quality tests
				421	wise use of water	174	wise use of water supply
				425	water cycle and conservation	175	maintaining water supply quality
				430	water usage and quality		

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INQ4.3 Physical Science	Science in Society	To enable students to demonstrate positive attitudes toward science necessary for solving problems and making personal decisions about issues that affect individuals, society, and the environment	Career Goals - Development of scientific skills may lead to rewarding careers and productive contributions to society		174 water quality testing 177 chemistry and photography

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INQ4.4 Physical Science	Science in Society	To enable students to demonstrate positive attitudes toward science necessary for solving problems and making personal decisions about issues that affect individuals, society, and the environment	Societal Needs - Science and technology combine to meet the needs of a society	74	sample engineering problem	70	designing and testing different electric motors
				364	petroleum	70	proposing and comparing different electric motor designs
				379	research fuel cells	71	did draining the batteries affect motor speed?
				379	research environmental impact of fuel cells	71	which motor gave the highest speed and why?
				400	problems caused by airborne pollutants	163	consider a vehicle's fuel economy
				421	wise use of water	163	research how trees offset accumulation of CO ₂
				425	water cycle and conservation	163	can trees compensate for manmade CO ₂ from vehicles and industry?
				430	water usage and quality	172	save water for houseplants
						172	perform water quality tests
						174	wise use of water supply
		175	maintaining water supply quality				

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INQ4.5 Physical Science	Science in Society	To enable students to demonstrate positive attitudes toward science necessary for solving problems and making personal decisions about issues that affect individuals, society, and the environment	Economics - Scientific knowledge provides a basis for understanding the economic value of applied technology	368 limiting reactants 379 research fuel cells 379 research economic impact of fuel cells 400 economic impact of pollution 400 economic impact of reducing air pollution 448 research economic impact of producing gases that cause acid rain	163 economic impact of end-product of combustion reaction

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INQ4.6 Physical Science	Science in Society	To enable students to demonstrate positive attitudes toward science necessary for solving problems and making personal decisions about issues that affect individuals, society, and the environment	Politics - Sound scientific understanding should guide political decisions	333	problems with disposing of plastics	52	the cost of using electrical appliances
				355	recycling tires	163	economic impact of end-product of combustion reaction
				356	recycling discarded tires		
				364	petroleum	163	too much CO ₂
				368	limiting reactants	163	consider a vehicle's fuel economy
				379	research fuel cells		
				379	research environmental impact of fuel cells	163	research how trees offset accumulation of CO ₂
				379	research fuel cells	163	can trees compensate for manmade CO ₂ from vehicles and industry?
				379	hydrogen-powered cars and the environment		
				379	research economic impact of fuel cells	172	save water for houseplants
				391	impact of nuclear energy	172	perform water quality tests
				391	nuclear vs. fossil fuels	174	wise use of water supply
				392	storage of nuclear waste	175	maintaining water supply quality
				395	fossil fuels	178	investigate effect of acid rain on microorganisms
				400	economic impact of reducing air pollution		
				400	clean air act of 1970		
				400	economic impact of pollution		
400	problems caused by airborne pollutants						
400	reducing pollution						

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				421	
					wise use of water
				425	
					water cycle and conservation
				430	
					water usage and quality
				444	
					acid rain explained
				444	
					impact of using fossil fuels
				448	
					research economic impact of producing gases that cause acid rain
				448	
					research the issue of acid rain

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PS1.1 Physical Science	Force and Motion	The student will explore the concepts of force and motion.	investigate the relationship between speed, velocity, and acceleration	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	calculate speed of moving car
				24	accurate speed measurements	12	model the car's motion graphically
				29	position vs. time graph discussion	12	find speed of car at different positions
				30	position vs. time graphs	13	make a position vs. time graph
				32	average speed vs. instantaneous	14	calculate acceleration of car on ramp
				32	average speed discussed	14	acceleration is the rate at which speed changes
				33	understanding acceleration	14	calculate speed of car at two places on the ramp
				35	how to calculate acceleration	15	make a speed vs. time graph
				36	examples of acceleration	15	changes in motion can be represented graphically
				37	speed vs. time graphs	17	explore 2nd law and acceleration
				37	speed vs. time graph discussion	17	calculate speed of car
				41	find acceleration of car	36	find speed of marble
				42	calculate speed from distance/time graph		
				49	link between force and acceleration		
53	acceleration due to gravity						

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PS1.2 Physical Science	Force and Motion	The student will explore the concepts of force and motion.	analyze and apply Newton's three laws of motion	45	Newton's third law summarized	14	exploring acceleration on a ramp
				45	Newton's second law summarized	16	2nd law
				45	Newton's first law summarized	16	unbalanced forces and acceleration of car
				46	force has potential to change motion	16	thinking about force
				48	Newton's laws explained and applied	19	discover 2nd law of motion
				48	Newton's first law in detail	19	find correct relationship between force mass and acceleration
				49	force is related to acceleration	20	force and motion with car and ramp
				49	Newton's second law in detail	22	car and ramp and Newton's 3rd law
				50	Newton's second law applied	23	using 3rd law to explain common phenomena
				51	net force explained		
				51	balanced and unbalanced forces		
				59	Newton's third law in detail		
				64	solving problems using $f=ma$		

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PS1.3 Physical Science	Force and Motion	The student will explore the concepts of force and motion.	relate gravitational force to mass and distance	47	weight vs. mass	20	investigate effect of gravity on motion
				52	gravity depends on mass		
				52	the effect of gravity	20	weight vs. mass
				53	how to calculate weight		
				54	Newton's law of universal gravitation		
				55	calculating gravitational force between objects		

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PS1.4 Physical Science	Force and Motion	The student will explore the concepts of force and motion.	demonstrate the relationship between work, power, and machines	67	how simple machines manipulate forces	25	discover mechanical advantage of ropes and pulleys
				69	how to calculate mechanical advantage	27	changing force and distance on a lever
				70	mechanical advantage of block and tackle	27	set up a lever that has mechanical advantage
				71	the human body and simple machines	30	exploring force and distance with ropes and pulleys
				71	how a lever works	31	calculate work done on block
				71	pliers as an example of a lever	31	work output vs. work input
				71	parts of a lever	31	work = force X distance
				72	mechanical advantage of a lever	185	find efficiency of water heater
				75	how gears work		
				78	set up a lever with MA greater than 1		
				78	design a toothbrush		
				79	calculate mechanical advantage		
				79	analyze pulleys with different numbers of supporting strings		
				79	analyze block and tackle		
				80	analyze block and tackle machine on a sailboat		
				80	analyzing the jaw as a lever		

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				80	
				analyze wheelbarrow	
				83	
				how to calculate work	
				84	
				work input and output	
				85	
				efficiency explained	
				85	
				efficiency and bicycles	
				86	
				power explained	
				86	
				how to calculate power	
				96	
				calculate work done	
				96	
				decide whether or not work is done	
				97	
				calculate work output from efficiency data	
				97	
				compare different amounts of work done	
				97	
				calculate power	
				97	
				analyze power of motor	
				97	
				calculate power of two different machines	
				97	
				find the efficiency of a machine	
				97	
				calculate work accomplished by a motor	
				138	
				how to calculate electrical power	
				488	
				work vs. calories used by the body	

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				488 work vs. calories used by the body 491 work and mechanical systems	
PS1.5 Physical Science	Force and Motion	The student will explore the concepts of force and motion.	examine the law of conservation of momentum in everyday situations	60 law of conservation of momentum 60 how to calculate momentum 64 calculate momentum	

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PS2.1 Physical Science	Structure and Properties of Matter	The student will examine the structure, properties, and classes of matter.	classify and identify matter as pure substances or mixtures	278	mixtures can be separated by physical means	114	separating a homogeneous mixture
				278	pure substances cannot be separated by physical means	114	investigating a mixture
				278	compounds are composed of elements	132	building atom models
				279	summary of matter classification	132	comparing atoms
				283	atoms and molecules	132	atomic number determines what element that atom is
				288	create a poster of matter classification	133	exploring isotopes
				311	location/size/charge of subatomic particles	133	protons and neutrons
				311	all matter is formed from atoms	133	identify mass number
				311	protons/neutrons/electrons	133	identify atomic number
				315	atoms of same element have same atomic number	133	identify element symbol and name
				315	atomic number discussed	133	location of electrons in atom
				316	mass number discussed	136	model stable and neutral atoms
				316	isotopes explained	136	atomic number
				318	proton/electron attraction	136	mass number
				322	chemical symbols and element names	136	understanding isotopes
				322	atomic number on the periodic table	137	build atomic models

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				322 mass number on the periodic table	140 review subatomic particles
				322 atomic mass on the periodic table	140 why do atoms form chemical bonds?
					141 compare and contrast elements and compounds
					142 why do atoms combine in certain ratios?
					165 investigate solutions and colloids and suspensions

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PS2.2 Physical Science	Structure and Properties of Matter	The student will examine the structure, properties, and classes of matter.	explore matter in terms of specific properties	281	volume and mass contrasted	116	mass and volume measurements
				284	states of matter and arrangement of molecules	118	observe melting process and study quantitatively
				284	changes of state	118	molecules in a liquid
				285	characteristics of matter related to its state	118	investigate melting
				291	density is independent of amount of substance	118	think of melting process at molecular level
				291	density explained	119	energy and phase changes
				292	elasticity is a physical property of matter	124	build a density column
				292	hardness is a physical property of matter	126	investigating buoyancy with clay boats
				293	brittleness is a physical property of matter	128	use CPO viscometer to study viscosity
				294	tensile strength is a physical property of matter		
				294	malleability is a physical property of matter		
				295	relationship between mass volume and density		
				296	density of liquid water vs. ice		
				297	buoyancy explained		
				298	sinking and floating		
				302	viscosity of motor oils		

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Standard #: Course	Topic	Standard	Learning Expectations	Volume 1 Student Text page	Volume 2 Investigation Manual page
				305	viscosity of glue mixtures
PS3.1 Physical Science	Interactions of Matter	The student will investigate the interactions of matter.	investigate chemical and physical changes	353 354 355 357 361 372	146 investigate and observe chemical and physical changes in the lab

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Standard #: Course	Topic	Standard	Learning Expectations	Volume 1 Student Text page	Volume 2 Investigation Manual page		
PS3.2 Physical Science	Interactions of Matter	The student will investigate the interactions of matter.	analyze chemical equations	234	electrons and energy levels and light emission	132	building atom models
				315	atoms of same element have same atomic number	132	atomic number determines what element that atom is
				315	atomic number discussed	133	identify element symbol and name
				316	mass number discussed	133	using the periodic table
				316	isotopes explained	133	exploring isotopes
				318	proton/electron attraction	133	identify atomic number
				320	groups of elements	133	identify mass number
				321	studying the periodic table	134	what does atomic structure have to do with light and color?
				322	atomic number on the periodic table	136	atomic number
				322	mass number on the periodic table	136	mass number
				322	atomic mass on the periodic table	136	understanding isotopes
				322	chemical symbols and element names	136	model stable and neutral atoms
				324	which element is more likely to combine with other elements?	136	building and studying the periodic table
				324	use the periodic table to predict chemical formulas	136	ions
				332	metals nonmetals and metalloids	137	importance of atomic number
				335	chemical bonding and the periodic table	138	fusion and fission
				141	modeling a chemical bond		
				141	when an atom ionizes		

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Standard #: Course	Topic	Standard	Learning Expectations	Volume 1 Student Text page	Volume 2 Investigation Manual page
				336 writing chemical formulas 343 what is a mole? 368 predicting amount of product 387 fusion and fission explained	143 ionic compounds 155 calculating product yield
PS3.3 Physical Science	Interactions of Matter	The student will investigate the interactions of matter.	compare and contrast acids and bases	437 concentration of ions and pH 440 examples of acid and base chemistry 443 pH and blood	176 measure pH 176 investigate acids and bases 176 measure pH of everyday solutions
PS3.4 Physical Science	Interactions of Matter	The student will investigate the interactions of matter.	explore the law of conservation of mass	363 history of law of conservation of mass	150 investigate conservation of mass in effervescent tablet reaction

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Standard #: Course	Topic	Standard	Learning Expectations	Volume 1 Student Text page	Volume 2 Investigation Manual page		
PS4.1 Physical Science	Energy	The student will compare and contrast the various forms of energy.	investigate the properties and behaviors of waves	195	waves transmit energy	82	study wave pulses on elastic cord
				197	transverse and longitudinal waves	83	measure speed of a wave pulse
				198	frequency and wavelength and amplitude	83	find speed of a wave
				204	resonance explained	84	make different types of waves in a ripple tank
				205	standing waves on a string	86	investigate frequency and wavelength
				206	constructive and destructive interference	86	adjust frequency of a standing wave
				210	natural frequency of a building and earthquakes	87	investigating resonance
				210	can wave interference sink a ship?	88	natural frequency and resonance of standing waves on a string
				215	properties of sound waves	95	investigate interference with sound waves
				221	importance of wavelength of sound waves	96	investigating sound resonance
				223	interference of sound waves	101	examine light through diffraction grating
				225	consonance and dissonance and beats	102	polarization of water waves
				240	polarization of light	102	polarization of a spring wave
				242	properties of light waves	102	polarization of light
				474	energy and radiation relationships		

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Standard #: Course	Topic	Standard	Learning Expectations	Volume 1 Student Text page	Volume 2 Investigation Manual page		
PS4.2 Physical Science	Energy	The student will compare and contrast the various forms of energy.	explore and explain the nature of sound and light	201	waves and absorption	85	observing reflection in water waves
				201	waves and reflection	90	what is sound and how do we hear it?
				201	reflection in water waves and light waves	90	investigate human perception of sound
				201	waves and refraction	90	investigate human perception of sound
				202	refraction and eyeglasses	94	does sound behave like other waves?
				213	how the ear works	95	interference and sound waves
				217	loudness and decibels	98	investigate sound and music
				219	frequency of sound and pitch	100	study what makes light
				220	voice recognition programs	101	observing white light through diffraction grating
				220	white noise	104	investigate RGB model of color
				220	sonograms	105	explore relationship between color and wavelength
				222	effect of temperature on speed of sound wave	106	tracing incident and reflected rays
				222	effect of medium on speed of sound wave	107	investigate how light interacts with mirrors
				226	musical instruments	107	investigate reflection of light
				234	what makes light?		
				237	visible light and the electromagnetic spectrum		
				242	color and frequency of light waves		
				243	RGB model of color		

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Standard #: Course	Topic	Standard	Learning Expectations	Volume 1 Student Text page	Volume 2 Investigation Manual page		
				245	we see color in terms of reflected light	107	plot reflected rays from a mirror
				258	refraction in optical systems	108	explore refraction with lenses
				258	forming images with lenses	108	investigate how light interacts with a prism
				260	reflection and mirrors	108	explore refraction with a prism
				261	refraction and lenses		
				263	index of refraction	108	tracing incident and refracted rays
				263	index of refraction	110	finding focal point and focal length of a lens
				264	human eye as an optical instrument	111	plotting images formed when light is refracted by a lens
				273	find the angle of reflection		
				476	absorption and emission	134	investigating visible light with a spectrometer

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PS4.3 Physical Science	Energy	The student will compare and contrast the various forms of energy.	examine the applications and effects of heat	452	temperature scales	119	investigate temperature and energy transfer in melting process
				455	temperature and thermal energy and heat	182	relationship between heat and temperature
				457	specific heat and the heat equation	190	investigate conduction through all states of matter
				458	specific heat	190	investigate and rank materials for thermal conductivity
				459	specific heat of different substances	192	investigate convection in liquids
				468	densely packed solids are good conductors of heat	194	investigate radiation emitted by solids
				468	heat transfer through air	194	investigate radiation emitted by liquids
				469	thermal conductivity explained		
				470	warming hands over candle		
				470	convection currents and weather		
				472	convection currents in water		
				476	solid road surface emits radiation		
				478	apply knowledge of heat transfer to different situations		
				481	global warming		
				481	global warming and heat transfer by radiation		

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				488 cooling processes and the human body 488 cooling processes and the human body 491 heat generated in mechanical systems 493 using heat to do mechanical work 494 cooling processes and mechanical systems 494 cooling processes and mechanical systems	
PS4.4 Physical Science	Energy	The student will compare and contrast the various forms of energy.	distinguish between nuclear fission and nuclear fusion	387 fusion and fission explained 388 nuclear vs chemical reactions	138 fusion and fission 138 nuclear reactions 160 radioactive decay 160 how do you simulate nuclear decay?

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PS4.5 Physical Science	Energy	The student will compare and contrast the various forms of energy.	investigate the law of conservation of energy	88	potential and kinetic energy explained	36	energy conservation and the roller coaster
				90	conservation of energy explained	37	investigating conservation of energy with rollercoaster
				91	following an energy transformation	38	identify potential/kinetic energy conversions
				91	understand basic forms of energy	38	explore energy transformations
				91	energy conversions	38	conservation of energy and energy transformations
				92	energy transformations and conservation	39	identify type of energy involved
				93	different forms of energy described	188	specific heat and conservation of energy
				96	prove that energy is conserved		