

**Correlation to Virginia Public Schools: Science Standards of Learning  
 Foundations of Physical Science with Earth and Space Science  
 Student Text and Investigation Manual**

Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES01.a	Earth Science	The student will plan and conduct investigations in which:	Volume, area, mass, elapsed time, direction, temperature, pressure, distance, density, and changes in elevation/depth are calculated utilizing the most appropriate tools.	5	measuring distance	5	measuring metric and english lengths
				9	steps in the scientific method	6	measure time
				10	forming a hypothesis	7	perform your own experiment
				19	design your own experiment	7	compare results with hypothesis
				288	find the thickness of a single card	9	conduct three experiments with appropriate equipment
				448	describe steps you would take to determine whether pH affects frog population	9	design three experiments and choose equipment
						9	design three experiments and choose equipment
						10	conduct car/ramp experiment
						10	selecting ramp and photogates
						12	select equipment and set up experiment
						16	investigate Newton's 2nd law
						16	measure force
						30	rigging block and tackle
						34	investigate motion on a rollercoaster
						44	measure voltage
						46	measure current

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						48	measure resistance
						75	plan three experiments to determine which variable affects the period of a pendulum
						75	perform self-designed experiment
						87	measure wavelength
						116	measure mass
						117	measure volume
						145	plan a procedure and select necessary equipment
						145	carry out procedure and select equipment
						151	plan procedures and select materials
						151	select materials from list
						170	which factor will produce fastest dissolving rate?
						178	visit local water supply and perform testing
						182	simulating the effect of acid rain on daphnia
						186	measure temperature
						188	conducting investigation of efficiency of immersion heater

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						193	conducting experiments on heat transfer
						194	design and construct an aneroid barometer
						198	making qualitative observations of the amount of ozone present in the school environment
						205	investigating how specific heat of water regulates Earth's temperature
						209	measuring the intensity of light using an electric meter and solar cell and light bulb
						237	develop a research plan for studying volcanoes
						252	identifying the parts of a refracting telescope and making observations of the moon's surface

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES01.b	Earth Science	The student will plan and conduct investigations in which:	Technologies, including computers, probeware, and global positioning systems (GPS) are used to collect, analyze, and report data and to demonstrate concepts and simulate experimental conditions.	12	importance of reliable and accurate data collection		data tables and graphs can be created on computer or graphing calculator
				24	making a graph	4	difference between precise and accurate data
				26	creating graphs	6	electronic timer and release technique
				41	make a graph	7	record time interval
				485	computer modeling to predict greenhouse effects	9	construct a data table
				630	what evidence was used to predict the existence of the Kuiper Belt?	9	collect speed data
				630	use the data to answer the questions	9	design three experiments and choose technology
				652	analysis with a spectrometer (#4)	12	understand and use data table
						13	graph distance vs. time
						14	record three different time intervals
						15	construct a quantitative graphical model
						17	record times
						17	record results in data table
						18	organize different combinations of data
						24	collect weight data
						24	use data table to record results

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						25	collect force data
						27	use data table to record results
						27	write down the number of weights you use
						30	record ropes and pulley data in table
						36	collect precise speed and height data
						36	organize data into a table
						37	organize data into a graph of speed vs. height
						40	choose circuit parts to light a bulb
						51	graph voltage vs. current
						75	collect mass and amplitude data
						75	create data table for self-designed experiment
						121	graph mass vs. volume
						147	organize observations into a category table
						150	record data as you perform experiment
						151	design a data table
						151	does your experiment agree with law of conservation of mass?

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						171	use data table for observations
						171	collect time data and record observations
						181	organize water quality data into a table
						182	making detailed observations
						182	observing daphnia and recording movements and behavior
						184	collecting pH readings while adding carbon dioxide
						185	constructing a graph of drops of acid vs pH
						186	collecting temperature data
						187	construct a graphical model
						189	construct a temperature vs. time graph
						189	collecting time and temperature data
						193	collecting and recording time and temperature data
						197	constructing a graph from atmospheric pressure data

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						203 graphing water and ice temperature readings 206 collecting temperature and time data 206 constructing a graph of time vs. temperature 210 collecting qualitative data of light intensity at scale distance from the sun 217 collecting wet and dry bulb temperature readings 231 evaluating your completed bathymetric map 247 evaluate your ability to interpret rock formations 249 using your sundial to collect accurate data 253 calibrating your telescope	
ES01.c	Earth Science	The student will plan and conduct investigations in which:	Scales, diagrams, maps, charts, graphs, tables, and profiles are constructed and interpreted.	510 540 541 553 567 580	using maps to identify mountain ranges where earthquakes occur earthquake hazard map using a map to identify volcanoes geologic hazard maps using a geologic hazard map	228 229 229 237	reading a bathymetric map using a geologic hazard map of frequent earthquakes using a globe to identify mountain ranges plot locations of volcanoes using latitude and longitude

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ES01.d	Earth Science	The student will plan and conduct investigations in which:	Variables are manipulated with repeated trials.	11	control and experimental variables	7	doing a controlled experiment
				26	independent and dependent variables	21	choose independent and dependent variables for graph
						27	recognize variables
						190	effect of changing mass on collected data
						211	determining whether distance from light source or axial tilt plays a more significant role in causing the seasons

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ES01.e	Earth Science	The student will plan and conduct investigations in which:	A scientific viewpoint is constructed and defended (the nature of science).	20	finding variability in data	6	predict which car will move fastest
				28	identifying cause and effect relationships	7	variables in an experiment
				41	identify cause and effect	7	test the effect of one other variable
				79	look at force data and decide the usefulness of a machine	9	devise a hypothesis
				438	what causes acid rain	18	use data to describe relationship between force and motion
				448	forming a hypothesis and testing through experimentation (#5)	19	use data to infer correct relationship between variables
				451	what is temperature	21	construct reasonable explanation based on data
				456	determining effect of changing mass on temperature changes	21	determine effect of increasing mass
				460	thermal equilibrium	27	think about the variables
				497	factors that shape the weather	30	interpret block and tackle data
				530	proving hypotheses for sea-floor spreading	34	where does the marble move the fastest?
				580	form a hypothesis (#7)	35	study data and determine importance of height on speed of marble
				602	identify question, hypothesis, procedure, and results (#1)	43	how did A and B tapes acquire different charge?
				608	relationship between orbital speed and distance between two objects	45	analyze data and explain a rule

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						75	investigate variables that affect the period of a pendulum
						141	build models of Na and Cl and use them to explain bonding
						151	explain how hypothesis compares to results
						151	perform the experiment you designed
						157	add new rules to list based on findings
						170	devise hypothesis and explain
						170	which method will give fastest dissolving rate?
						170	devise hypothesis and explain
						182	making hypotheses and testing them against observations
						182	formulate hypothesis
						185	analyzing the results of the buffered acid experiment
						190	effect of changing mass on data
						193	explaining efficiency of heat transfer based on data

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						197	identifying relationships between air pressure and weather
						197	evaluating your aneroid barometer design
						206	identifying relationship between percent of Earth covered in water and temperature range
						208	formulate a hypothesis about why the seasons occur
						208	testing hypothesis of why seasons occur against your observations in the investigation
						224	sequencing events
						224	reconstruct a series of events from clues
						235	interpreting how the drumming affects the intensity of the earthquake in the model
						235	concluding which conditions affect the timing and duration and intensity of an earthquake based on observation
						241	justify which scenario was most likely

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						256	investigation discovering relationship between orbital speed and distance
ES02.a	Earth Science	The student will demonstrate scientific reasoning and logic by:	Analyzing how science explains and predicts the interactions and dynamics of complex Earth systems.	20	how will speed change?	21	construct reasonable explanation based on data
				24	predicting speed from a graph	35	study data and determine importance of height on speed of marble
				42	predict the speed of a car	45	analyze data and explain a rule
				180	harmonic motion in natural systems	76	use data to predict best string length for a pendulum clock
				258	optical systems	121	use graph to predict mass of six objects
				278	system of classifying matter	156	make predictions about solubility
				407	a solute and a solvent make up a system	201	predicting areas with high ozone concentration based on your data
						204	predicting what would happen if you place your ice/water test tube into a hot cup or a cold cup
						239	estimating the number of meteor collisions on Earth during the last 3.5 billion years
						242	predicting the results of the crystal-growing experiment

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES02.b	Earth Science	The student will demonstrate scientific reasoning and logic by:	Recognizing that evidence is required to evaluate hypotheses and explanations.	10	process of reviewing hypothesis explained	13	graph distance vs. time
				24	making a graph	15	construct a quantitative graphical model
				26	creating graphs	21	construct reasonable explanation based on data
				41	make a graph	35	study data and determine importance of height on speed of marble
				521	relative dating and modern geology based on Steno's theories	37	organize data into a graph of speed vs. height
				524	Kelvin's calculations of Earth's age	39	review energy theory in context of everyday scenarios
				528	theory of plate tectonics	39	analyze energy transformations in different scenarios
				563	Darwin's theories of the Andes formation	45	analyze data and explain a rule
				566	what causes ice ages	51	graph voltage vs. current
				611	theories of origin of the moon	77	compare law of conservation of energy to motion of pendulum
				647	Big Bang theory	121	graph mass vs. volume
						147	organize observations into a category table
						151	does your experiment agree with law of conservation of mass?
						151	do the data support the hypothesis

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						151	review your hypothesis
						171	what was happening at molecular level?
						171	did you prove or disprove your hypothesis?
						185	constructing a graph of drops of acid vs pH
						187	construct a graphical model
						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
						231	evaluating your completed bathymetric map
						247	evaluate your ability to interpret rock formations

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ES02.c	Earth Science	The student will demonstrate scientific reasoning and logic by:	Comparing different scientific explanations for the same observations about the Earth.	440	oceans as part of the hydrosphere	21	construct reasonable explanation based on data
				441	the five major oceans	35	study data and determine importance of height on speed of marble
				447	name the five big oceans on Earth	45	analyze data and explain a rule
				471	description of Earth's atmosphere		
				472	effect of life on Earth's atmosphere		
				477	layers of the atmosphere		
				478	layers of the atmosphere		
				481	global warming		

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ES02.d	Earth Science	The student will demonstrate scientific reasoning and logic by:	Explaining that observation and logic are essential for reaching a conclusion.	19	which group did the best experiment?	6	predict which car will move fastest
				20	finding variability in data	7	test the effect of one other variable
				79	look at force data and decide the usefulness of a machine	9	devise a hypothesis
				372	observe chemical changes	18	evaluate graphs as to whether or not they show relationships between variables
						18	use data to describe relationship between force and motion
						19	use data to infer correct relationship between variables
						21	evaluate percent change for data collected
						27	think about the variables
						30	interpret block and tackle data
						34	where does the marble move the fastest?
						43	how did A and B tapes acquire different charge?
						75	evaluate statistical significance
						75	investigate variables that affect the period of a pendulum

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						100	observe glow-in-the-dark paper
						141	build models of Na and Cl and use them to explain bonding
						146	observe evidence of chemical change
						151	perform the experiment you designed
						151	explain how hypothesis compares to results
						158	observe temperature changes in chemical reactions
						169	observe Tyndall effect
						170	devise hypothesis and explain
						171	evaluate method based on data
						172	observe dissolving process
						179	make observations about local surface water
						182	making hypotheses and testing them against observations
						185	analyzing the results of the buffered acid experiment

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						186	sensing temperature with fingers
						192	observe convection currents
						192	observing forced convection through liquids
						193	explaining efficiency of heat transfer based on data
						200	evaluating your qualitative ozone strips
						202	using your hand to sense temperature differences
						208	testing hypothesis of why seasons occur against your observations in the investigation
						224	reconstruct a series of events from clues
						235	interpreting how the drumming affects the intensity of the earthquake in the model

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ES02.e	Earth Science	The student will demonstrate scientific reasoning and logic by:	Evaluating evidence for scientific theories.	19	which group did the best experiment?	13	graph distance vs. time
				24	making a graph	15	construct a quantitative graphical model
				26	creating graphs	18	evaluate graphs as to whether or not they show relationships between variables
				34	Newton's research impacted mathematics		
				41	make a graph	21	evaluate percent change for data collected
				73	impact of Da Vinci's work		
				73	impact of technology	37	organize data into a graph of speed vs. height
				395	impact of industrial revolution	39	analyze energy transformations in different scenarios
				443	impact of carbon dioxide on life in the oceans		
				479	scientists detect loss of ozone in atmosphere	39	review energy theory in context of everyday scenarios
				482	effects of global warming discovered	39	critique group's explanation of energy transformations
				496	tracking ocean currents		
				511	trees and global climate	51	graph voltage vs. current
				521	relative dating and modern geology based on Steno's theories	75	evaluate statistical significance
				524	Kelvin's calculations of Earth's age	77	compare law of conservation of energy to motion of pendulum
				528	theory of plate tectonics	77	show how energy loss data could be applied to designing a real clock
				529	critiquing Wegener's theories of continental drift	121	graph mass vs. volume

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				542	studying seismic waves leads to information used in oil and gas exploration	147	organize observations into a category table
				545	predicting tsunamis	151	does your experiment agree with law of conservation of mass?
				563	Darwin's theories of the Andes formation	171	evaluate method based on data
				566	what causes ice ages	185	constructing a graph of drops of acid vs pH
				568	urban sprawl	187	construct a graphical model
				611	theories of origin of the moon	189	construct a temperature vs. time graph
				612	early theories of the solar system	197	constructing a graph from atmospheric pressure data
				647	Big Bang theory	200	evaluating your qualitative ozone strips
						203	graphing water and ice temperature readings
						206	constructing a graph of time vs. temperature
						231	evaluating your completed bathymetric map
						247	evaluate your ability to interpret rock formations

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ES03.a	Earth Science	The student will investigate and understand how to read and interpret maps, globes, charts, and imagery.	Maps (bathymetric, geologic, topographic, and weather) and star charts.	510 540 541 553 567 580	using maps to identify mountain ranges where earthquakes occur earthquake hazard map using a map to identify volcanoes geologic hazard maps using a geologic hazard map	228 229 229 237	reading a bathymetric map using a globe to identify mountain ranges using a geologic hazard map of frequent earthquakes plot locations of volcanoes using latitude and longitude
ES03.b	Earth Science	The student will investigate and understand how to read and interpret maps, globes, charts, and imagery.	Imagery (aerial photography and satellite images)	451 452 474 497 497 499 505 506 507	thermometers thermometers measuring atmospheric pressure with barometers factors which influence the weather sling psychrometer cloud formation description of thunderstorms description of hurricanes description of tornadoes	186 194 218 219 220	accurately measuring temperature using thermometers construct and use an aneroid barometer using Doppler radar images to detect and track storms use radar to detect a tornado using radar to track a hurricane
ES03.c	Earth Science	The student will investigate and understand how to read and interpret maps, globes, charts, and imagery.	Direction and distance measurements on any map or globe.			237	plot locations of volcanoes using latitude and longitude

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ES03.d	Earth Science	The student will investigate and understand how to read and interpret maps, globes, charts, and imagery.	Location by latitude and longitude and topographic profiles.			237	plot locations of volcanoes using latitude and longitude
ES04.a	Earth Science	The student will investigate and understand the characteristics of the Earth and the solar system.	Position of the Earth in the solar system.	613	explanation and illustration of the solar system	258	setting up a scale model of the solar system
				614	relative sizes and distances within the solar system	259	determining scale distances for the planets
						260	determining scale sizes of the planets

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ES04.b	Earth Science	The student will investigate and understand the characteristics of the Earth and the solar system.	Sun-Earth-moon relationships (seasons, tides, and eclipses).	491	the effects of Earth's rotation on daytime heating and nighttime cooling	208	developing a hypothesis about why the seasons occur
				492	Earth's tilt causes seasons	209	investigating factors which cause the seasons
				492	Earth's tilt causes seasons	210	investigating how the distance of Earth from the sun affects its intensity
				518	create a model to explain why Earth has seasons	211	investigating how Earth's tilt affects the sun's intensity
				584	the lunar cycle	238	why studying the moon's surface is useful for understanding Earth
				585	Earth's rotation and patterns of day and night	248	building a sundial to keep track of daily time based on the cycles between Earth and the sun
				587	axial tilt causes the seasons	250	modeling the lunar cycle
				588	solar eclipses	251	constructing a lunar calendar
				588	lunar eclipses		
				589	solar eclipses		
				589	solar eclipses		
				601	identify seasons		
				607	properties of the moon		
				608	the moon as a satellite of Earth		
				609	the moon's effect on tides on Earth		
				610	the Earth-moon system		
				611	giant impact theory		

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ES04.c	Earth Science	The student will investigate and understand the characteristics of the Earth and the solar system.	Characteristics of the sun, planets, their moons, comets, meteors, and asteroids.	612 619 620	orbits of planets around the sun asteroids and comets meteors and meteorites and the Kuiper Belt	256	simulate an object in orbit and investigate how orbital period varies within distance
ES04.d	Earth Science	The student will investigate and understand the characteristics of the Earth and the solar system.	The history and contributions of the space program.	48 50 594 595 596 597 598 599 599 634	Newton's laws explained and applied Newton's second law applied history of the telescope types and uses of telescopes types and uses of telescopes satellites as tools of astronomy spacecraft as tools of astronomy Newton's first law of motion and the space shuttle how the space shuttle works the use of spectroscopy to analyze stars	264 268	understand why spectroscopy is an important tool of astronomers measuring apparent brightness to calculate the distance to stars and galaxies

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ES05.a	Earth Science	The student will investigate and understand how to identify major rock-forming and ore minerals based on physical and chemical properties.	properties include hardness, color and streak, luster, cleavage, fracture, and unique properties.	570 571 572	properties of minerals common minerals Mohs hardness scale		
ES05.b	Earth Science	The student will investigate and understand how to identify major rock-forming and ore minerals based on physical and chemical properties.	Uses of minerals.	542 560 570 571 572	using seismic waves for oil and gas exploration mineral deposits and diamonds properties of minerals common minerals Mohs hardness scale		

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ES06.a	Earth Science	The student will investigate and understand how to identify common rock types based on mineral composition and textures and the rock cycle as it relates to the origin and transformation of rock types.	igneous (intrusive and extrusive) rocks.	554	properties of volcanically formed rock	237	examining the magma chemistry of volcanoes and how it relates to a volcano's location
				559	types of volcanic rock		
				561	describing volcanic rock	242	understanding how igneous rocks are formed and growing crystals to investigate their formation
				573	formation of igneous and sedimentary and metamorphic rocks		
				575	identifying igneous and sedimentary and metamorphic rocks	244	understanding how sedimentary rocks are formed and creating sedimentary deposits to investigate them
						246	understanding and investigating how metamorphic rocks are formed
						247	interpreting how different rock formations were formed

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ES06.b	Earth Science	The student will investigate and understand how to identify common rock types based on mineral composition and textures and the rock cycle as it relates to the origin and transformation of rock types.	sedimentary (clastic and chemical) rocks.	554	properties of volcanically formed rock	237	examining the magma chemistry of volcanoes and how it relates to a volcano's location
				559	types of volcanic rock		
				561	describing volcanic rock	242	understanding how igneous rocks are formed and growing crystals to investigate their formation
				573	formation of igneous and sedimentary and metamorphic rocks		
				575	identifying igneous and sedimentary and metamorphic rocks	244	understanding how sedimentary rocks are formed and creating sedimentary deposits to investigate them
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ES06.c	Earth Science	The student will investigate and understand how to identify common rock types based on mineral composition and textures and the rock cycle as it relates to the origin and transformation of rock types.	metamorphic (foliated and unfoliated) rocks.	554	properties of volcanically formed rock	237	examining the magma chemistry of volcanoes and how it relates to a volcano's location
				559	types of volcanic rock		
				561	describing volcanic rock	242	understanding how igneous rocks are formed and growing crystals to investigate their formation
				573	formation of igneous and sedimentary and metamorphic rocks		
				575	identifying igneous and sedimentary and metamorphic rocks	244	understanding how sedimentary rocks are formed and creating sedimentary deposits to investigate them
						246	understanding and investigating how metamorphic rocks are formed
						247	interpreting how different rock formations were formed
ES07.a	Earth Science	The student will investigate and understand the differences between renewable and nonrenewable resources.	fossil fuels, minerals, rocks, water, and vegetation.	414	effect of electrical generating facilities on dissolved oxygen in water	178	predict the quality of surface water to be tested and justify your answer
				443	impact of increased CO2 in oceans		
				479	effects of CFC's on the ozone layer		
				482	effects of burning fossil fuels		
				515	permafrost		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES07.b	Earth Science	The student will investigate and understand the differences between renewable and nonrenewable resources.	advantages and disadvantages of various energy sources.	172 391 391 400 414  438  560  627 627	generating electric power nuclear vs. fossil fuels impact of nuclear energy reducing pollution environmental impact of electrical generating facilities  impact of using fossil fuels  description of geothermal energy  using photovoltaic cells the efficiency of photovoltaic cells	52  262  262	the cost of using electrical appliances  solar energy can be used to generate electricity without producing pollution  determine the efficiency of a photovoltaic cell
ES07.c	Earth Science	The student will investigate and understand the differences between renewable and nonrenewable resources.	resources found in Virginia.		featured in ancillary component		featured in ancillary component

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ES07.d	Earth Science	The student will investigate and understand the differences between renewable and nonrenewable resources.	making informed judgments related to resource use and its effects on Earth systems.	333	problems with disposing of plastics	163	consider a vehicle's fuel economy
				355	recycling tires	163	can trees compensate for manmade CO2 from vehicles and industry?
				356	recycling discarded tires		
				364	petroleum	164	perform water quality tests
				392	storage of nuclear waste		
				432	water cycle and conservation	178	wise use of water supply
				433	wise use of water	179	maintaining water supply quality
				435	water usage and quality	180	save water for houseplants
						180	perform water quality tests

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES07.e	Earth Science	The student will investigate and understand the differences between renewable and nonrenewable resources.	environmental costs and benefits.	368	limiting reactants	52	the cost of using electrical appliances
				379	research environmental impact of fuel cells	163	economic impact of end-product of combustion reaction
				379	research fuel cells	163	too much CO <sub>2</sub>
				379	research fuel cells	163	research how trees offset accumulation of CO <sub>2</sub>
				379	research economic impact of fuel cells	163	research how trees offset accumulation of CO <sub>2</sub>
				379	hydrogen-powered cars and the environment	163	research how trees offset accumulation of CO <sub>2</sub>
				391	impact of nuclear energy	163	can trees compensate for manmade CO <sub>2</sub> from vehicles and industry?
				391	nuclear vs. fossil fuels	164	perform water quality tests
				395	fossil fuels	178	wise use of water supply
				400	economic impact of reducing air pollution	180	perform water quality tests
				400	problems caused by airborne pollutants	201	research the causes of ozone in the lower atmosphere
				400	economic impact of pollution	262	solar energy can be used to generate electricity without producing pollution
				400	reducing pollution		
				414	environmental impact of electrical generating facilities		
				433	wise use of water		
				435	water usage and quality		
				436	effect of excess nitrates on environment		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				438	impact of using fossil fuels		
				448	research economic impact of producing gases that cause acid rain		
				627	using photovoltaic cells		
ES08.a	Earth Science	The student will investigate and understand geologic processes including plate tectonics.	How geologic processes are evidenced in the physiographic provinces of Virginia including the Coastal Plain, Piedmont, Blue Ridge, Valley and Ridge, and Appalachian Plateau.		featured in ancillary component		featured in ancillary component

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES08.b	Earth Science	The student will investigate and understand geologic processes including plate tectonics.	Processes (faulting, folding, volcanism, metamorphism, weathering, erosion, deposition, and sedimentation) and their resulting features.	528	predicting what Earth might look like in 50 million years	230	predicting plate movement over 50 million years and the resultant land features
				533	activity of Earth's crust at plate boundaries	240	estimating the effects of meteor impacts on Earth
				534	balance of creating and consuming Earth's crust	241	identifying which geologic features on Earth were caused by meteors
				534	land features resulting from divergent plate boundaries	242	understanding how igneous rocks are formed and growing crystals to investigate their formation
				535	resulting land features from subduction	244	understanding how sedimentary rocks are formed and creating sedimentary deposits to investigate them
				536	land features resulting from transform plate boundaries	246	understanding and investigating how metamorphic rocks are formed
				547	predict separation of North America and Europe in 75 million years	247	interpreting how different rock formations were formed
				548	predict effects of divergent plate boundaries on Great Rift Valley		
				555	formation of Hawaiian Islands due to volcanic activity		
				558	volcanoes shape the Earth		
				562	constructive and destructive processes		
				562	constructive and destructive processes		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				563	mountain-building		
				563	constructive process of mountain building		
				564	changes in land features due to erosion		
				564	the destructive process of erosion		
				565	formation of soil		
				565	wind erosion		
				566	effect of glaciers on land		
				573	formation of igneous and sedimentary and metamorphic rocks		
				575	identifying igneous and sedimentary and metamorphic rocks		
				576	the rock cycle		
				576	the rock cycle		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES08.c	Earth Science	The student will investigate and understand geologic processes including plate tectonics.	Tectonic processes (subduction, rifting and sea floor spreading, and continental collision).	528	predicting what Earth might look like in 50 million years	228	listing which kind of plate boundary is associated with each geologic feature
				528	definition of plate tectonics	229	identifying tectonic plates and plate boundaries
				530	sea-floor spreading and mid-ocean ridges	230	predicting plate movement over 50 million years and the resultant land features
				531	magnetic patterns on the sea floor	236	understanding the Volcanic Explosivity Index
				532	theory of plate tectonics	237	finding a pattern of volcanoes related to the locations of plate boundaries
				533	describing plate boundaries	240	estimating the effects of meteor impacts on Earth
				534	land features resulting from divergent plate boundaries	241	identifying which geologic features on Earth were caused by meteors
				534	divergent plate boundaries		
				535	convergent plate boundaries		
				535	resulting land features from subduction		
				536	transform plate boundaries		
				536	land features resulting from transform plate boundaries		
				537	causes and descriptions of earthquakes		
				539	earthquakes rating scales		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				542	using seismic waves for oil and gas exploration		
				547	predict separation of North America and Europe in 75 million years		
				548	predict effects of divergent plate boundaries on Great Rift Valley		
				554	types and shapes of volcanoes		
				555	formation of Hawaiian Islands due to volcanic activity		
				555	shield volcanoes		
				555	formation of shield volcanoes due to hot spots		
				556	formation of stratovolcanoes due to subduction		
				556	stratovolcanoes		
				558	volcanoes shape the Earth		
				560	mineral deposits and diamonds		
				563	constructive process of mountain building		
				563	mountain-building		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				564	changes in land features due to erosion		
				564	the destructive process of erosion		
				565	wind erosion		
				566	effect of glaciers on land		
ES09.a	Earth Science	The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans.	processes of soil development.	562	constructive and destructive processes		
				565	formation of soil		
				576	the rock cycle		
ES09.c	Earth Science	The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans.	identification of groundwater zones including water table, zone of saturation, and zone of aeration.		featured in ancillary component		featured in ancillary component

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ES09.d	Earth Science	The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans.	identification of other sources of fresh water including rivers, springs, and aquifers with reference to the hydrologic cycle.	440 559	oceans in the water cycle volcanoes and water vapor		
ES09.e	Earth Science	The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans.	dependence on freshwater resources and the effects of human usage on water quality.	411 433 433 434 435 436 437 437 443 444 445 471	effects of PCB's in Great Lakes The Clean Water Act water quality standards importance of water analysis water quality testing water quality testing effects of acid rain on natural environments acid rain impact of increased CO2 on oceans pollution and the ocean food chain pollution and the ocean food chain nitrogen cycle	178 178 179 182	actions to take to improve water quality predict the quality of surface water to be tested and justify your answer address what you can do to maintain or improve the water quality at the test site the effects of acid rain on organisms in aquatic environments

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ES09.f	Earth Science	The student will investigate and understand how freshwater resources are influenced by geologic processes and the activities of humans.	identification of the major watershed systems in Virginia including the Chesapeake Bay and its tributaries.		featured in ancillary component		featured in ancillary component
ES10.a	Earth Science	The student will investigate and understand that many aspects of the history and evolution of the Earth and life can be inferred by studying rocks and fossils.	traces or remains of ancient, often extinct, life are preserved by various means in many sedimentary rocks.	481 521 523 524 554 559 561 566	global warming origin of fossils faunal succession table and description of the geologic time scale properties of volcanically formed rock types of volcanic rock describing volcanic rock ice ages	237	examining the magma chemistry of volcanoes and how it relates to a volcano's location

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ES10.b	Earth Science	The student will investigate and understand that many aspects of the history and evolution of the Earth and life can be inferred by studying rocks and fossils.	superposition, cross-cutting relationships, index fossils, and radioactive decay are methods of dating bodies of rock.	393 393 400 521 522 523 523 569	radioisotopes in science and medicine carbon dating research pros and cons of nuclear technology origin of fossils relative dating faunal succession interpreting rock formations studying moon rocks on Earth	161  225 226	research pros and cons of uses for radioactive elements  determining the relative ages of rock formations sequencing events in a geologic cross-section
ES10.c	Earth Science	The student will investigate and understand that many aspects of the history and evolution of the Earth and life can be inferred by studying rocks and fossils.	absolute and relative dating have different applications but can be used together to determine the age of rocks and structures.	521 522 523 523 569	origin of fossils relative dating interpreting rock formations faunal succession studying moon rocks on Earth	225 226	determining the relative ages of rock formations sequencing events in a geologic cross-section
ES10.d	Earth Science	The student will investigate and understand that many aspects of the history and evolution of the Earth and life can be inferred by studying rocks and fossils.	rocks and fossils from many different geologic periods and epochs are found in Virginia.		featured in ancillary component		featured in ancillary component

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES11.a	Earth Science	The student will investigate and understand that oceans are complex, interactive, physical, chemical, and biological systems and are subject to long- and short-term variations.	physical and chemical changes (tides, waves, currents, sea level and ice cap variations, upwelling, and salinity concentrations.	440	supply of water to oceans	212	investigate how the ocean's salinity affects its density
				440	oceans as part of the hydrosphere		
				440	oceans in the water cycle		
				441	sources of salts in the ocean		
				441	the five major oceans		
				442	composition of seawater		
				447	name the five big oceans on Earth		
				471	description of Earth's atmosphere		
				472	effect of life on Earth's atmosphere		
				477	layers of the atmosphere		
				478	layers of the atmosphere		
				559	volcanoes and water vapor		

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ES11.b	Earth Science	The student will investigate and understand that oceans are complex, interactive, physical, chemical, and biological systems and are subject to long- and short-term variations.	importance of environmental and geologic implications.	411	effects of PCB's in Great Lakes	178	predict the quality of surface water to be tested and justify your answer
				414	effect of electrical generating facilities on dissolved oxygen in water	178	predict the quality of surface water to be tested and justify your answer
				433	The Clean Water Act		
				435	water quality testing		
				436	water quality testing	179	address what you can do to maintain or improve the water quality at the test site
				437	acid rain		
				443	impact of increased CO2 in oceans		
				443	impact of increased CO2 on oceans	182	the effects of acid rain on organisms in aquatic environments
				444	pollution and the ocean food chain		
				445	pollution and the ocean food chain		
				479	effects of CFC's on the ozone layer		
				482	effects of burning fossil fuels		
				515	permafrost		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES11.c	Earth Science	The student will investigate and understand that oceans are complex, interactive, physical, chemical, and biological systems and are subject to long- and short-term variations.	systems interactions (density differences, energy transfer, weather, and climate).	491	Earth's temperature varies with latitude	207	research how large bodies of water affect climate
				493	convection currents in the atmosphere	207	research how large bodies of water affect climate
				496	effects of the Gulf Stream on climate of Great Britain	213	exploring how temperature-dependent layering creates currents
				496	descriptions of ocean currents and their effects on climate	215	understanding the Atlantic gyre
				497	water in the atmosphere affects weather patterns	223	research a particular biome
				508	causes and effects of the El Nino Southern Oscillation		
				510	effect of cold ocean currents on formation of fog desserts		
				510	different types of deserts and how they are formed		
				511	effect of warm ocean currents on formation of tropical rainforest		
				511	how tropical rainforests are formed		
				513	effect of large bodies of water on climate		
				515	alpine tundra occurs at high altitudes		

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ES11.d	Earth Science	The student will investigate and understand that oceans are complex, interactive, physical, chemical, and biological systems and are subject to long- and short-term variations.	features of the sea floor (continental margins, trenches, mid-ocean ridges, and abyssal plains) reflect tectonic processes.	530 531	sea-floor spreading and mid-ocean ridges magnetic patterns on the sea floor	228	listing which kind of plate boundary is associated with each geologic feature
ES11.e	Earth Science	The student will investigate and understand that oceans are complex, interactive, physical, chemical, and biological systems and are subject to long- and short-term variations.	economic and public policy issues concerning the oceans and the coastal zone including the Chesapeake Bay.	411 433 433 434 435 436 437 443 444 445	effects of PCB's in Great Lakes water quality standards The Clean Water Act importance of water analysis water quality testing water quality testing acid rain impact of increased CO2 on oceans pollution and the ocean food chain pollution and the ocean food chain	178 179 182	predict the quality of surface water to be tested and justify your answer address what you can do to maintain or improve the water quality at the test site the effects of acid rain on organisms in aquatic environments

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES12.a	Earth Science	The student will investigate and understand the origin and evolution of the atmosphere and the interrelationship of geologic processes, biologic processes, and human activities on its composition and dynamics.	scientific evidence for atmospheric changes over geologic time.	414	effect of electrical generating facilities on dissolved oxygen in water	178	actions to take to improve water quality
				437	acid rain	178	predict the quality of surface water to be tested and justify your answer
				437	effects of acid rain on natural environments	182	the effects of acid rain on organisms in aquatic environments
				438	causes and health effects of acid rain	185	effect of ocean on carbon dioxide levels in the atmosphere
				439	illustration of acid rain formation	202	investigate the temperature effects of greenhouse gases
				443	impact of increased CO2 on oceans		
				443	impact of increased CO2 in oceans		
				471	nitrogen cycle		
				479	effects of CFC's on the ozone layer		
				481	global warming		
				481	greenhouse effect and greenhouse gasses		
				481	greenhouse conditions on Earth		
				482	effects of burning fossil fuels		
				482	changes to the oceans due to increasing global temperatures		
				483	global temperature changing over time		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				485	research the density of Venus' and Mars' atmospheres		
				504	temperature inversion		
				515	permafrost		
				528	Earth's surface is changing		
				568	how urban sprawl changes local climate		
				615	greenhouse conditions on Venus		
ES12.b	Earth Science	The student will investigate and understand the origin and evolution of the atmosphere and the interrelationship of geologic processes, biologic processes, and human activities on its composition and dynamics.	current theories related to the effects of early life on the chemical makeup of the atmosphere	439	illustration of acid rain formation	198	detecting ozone which is a protective atmosphere gas against high energy radiation
				471	composition of Earth's atmosphere		
				482	changes to the oceans due to increasing global temperatures		
				568	how urban sprawl changes local climate		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES12.c	Earth Science	The student will investigate and understand the origin and evolution of the atmosphere and the interrelationship of geologic processes, biologic processes, and human activities on its composition and dynamics.	comparison of the Earth's atmosphere to that of other planets.	472	comparison of Earth's atmosphere to other planets		
				481	greenhouse conditions on Earth		
				485	research the density of Venus' and Mars' atmospheres		
				615	what makes Earth capable of supporting life		
				615	greenhouse conditions on Venus		
				616	classifying the planets		
				617	classifying the planets		
				618	comparing properties of the planets		
				621	is Pluto a planet		

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ES12.d	Earth Science	The student will investigate and understand the origin and evolution of the atmosphere and the interrelationship of geologic processes, biologic processes, and human activities on its composition and dynamics.	atmospheric regulation mechanisms including the effects of density differences and energy transfer.	480	transfer of energy in and out of Earth's atmosphere	185	effect of ocean on carbon dioxide levels in the atmosphere
				481	greenhouse effect and greenhouse gasses	202	investigate the temperature effects of greenhouse gases
				493	convection currents in the atmosphere	213	exploring how temperature-dependent layering creates currents
				495	global wind patterns		
				502	cold fronts		
				502	effects of moving air masses		
				503	jet streams		
				503	warm fronts		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES12.e	Earth Science	The student will investigate and understand the origin and evolution of the atmosphere and the interrelationship of geologic processes, biologic processes, and human activities on its composition and dynamics.	potential atmospheric compositional changes due to human, biologic, and geologic activity.	414	effect of electrical generating facilities on dissolved oxygen in water	178	predict the quality of surface water to be tested and justify your answer
				437	acid rain	178	actions to take to improve water quality
				437	effects of acid rain on natural environments	182	the effects of acid rain on organisms in aquatic environments
				438	causes and health effects of acid rain	185	effect of ocean on carbon dioxide levels in the atmosphere
				439	illustration of acid rain formation	198	detecting ozone which is a protective atmosphere gas against high energy radiation
				443	impact of increased CO2 in oceans	202	investigate the temperature effects of greenhouse gases
				443	impact of increased CO2 on oceans		
				471	composition of Earth's atmosphere		
				471	nitrogen cycle		
				479	effects of CFC's on the ozone layer		
				481	greenhouse effect and greenhouse gasses		
				481	greenhouse conditions on Earth		
				482	effects of burning fossil fuels		
				482	changes to the oceans due to increasing global temperatures		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				485	research the density of Venus' and Mars' atmospheres		
				504	temperature inversion		
				515	permafrost		
				568	how urban sprawl changes local climate		
				615	greenhouse conditions on Venus		
ES13.a	Earth Science	The student will investigate and understand that energy transfer between the sun, Earth, and the Earth's atmosphere drives weather and climate on Earth.	observation and collection of weather data.	451	thermometers	186	accurately measuring temperature using thermometers
				452	thermometers		
				474	measuring atmospheric pressure with barometers	194	construct and use an aneroid barometer
				497	slings psychrometer	218	using Doppler radar images to detect and track storms

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES13.b	Earth Science	The student will investigate and understand that energy transfer between the sun, Earth, and the Earth's atmosphere drives weather and climate on Earth.	prediction of weather patterns.	492 497 498 499 501 505 506 507 518	Earth's tilt causes seasons factors which influence the weather phase changes in the atmosphere and dewpoint cloud formation forms of precipitation description of thunderstorms description of hurricanes description of tornadoes create a model to explain why Earth has seasons	209 217 219 220	investigating factors which cause the seasons finding relative humidity use radar to detect a tornado using radar to track a hurricane
ES13.c	Earth Science	The student will investigate and understand that energy transfer between the sun, Earth, and the Earth's atmosphere drives weather and climate on Earth.	severe weather occurrences such as tornadoes, hurricanes, and major storms.	518	write an action plan to stay safe during a tornado	219	describe what safety precautions the National Weather Service recommends for tornado conditions

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES13.d	Earth Science	The student will investigate and understand that energy transfer between the sun, Earth, and the Earth's atmosphere drives weather and climate on Earth.	weather phenomena and the factors that affect climate including radiation and convection.	480	transfer of energy in and out of Earth's atmosphere	207	research how large bodies of water affect climate
				483	global temperature changing over time	207	research how large bodies of water affect climate
				491	Earth's temperature varies with latitude	213	exploring how temperature-dependent layering creates currents
				493	convection currents in the atmosphere	215	understanding the Atlantic gyre
				494	the Coriolis effect	219	use radar to detect a tornado
				495	global wind patterns	220	using radar to track a hurricane
				496	descriptions of ocean currents and their effects on climate	223	research a particular biome
				496	effects of the Gulf Stream on climate of Great Britain		
				497	factors which influence the weather		
				497	water in the atmosphere affects weather patterns		
				499	cloud formation		
				502	effects of moving air masses		
				502	cold fronts		
				503	warm fronts		
				503	jet streams		
				504	rotation of air masses due to Coriolis effect		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				505	description of thunderstorms		
				506	description of hurricanes		
				507	description of tornadoes		
				508	causes and effects of the El Nino Southern Oscillation		
				510	effect of cold ocean currents on formation of fog deserts		
				510	different types of deserts and how they are formed		
				511	how tropical rainforests are formed		
				511	effect of warm ocean currents on formation of tropical rainforest		
				513	effect of large bodies of water on climate		
				515	alpine tundra occurs at high altitudes		
				528	Earth's surface is changing		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES14.a	Earth Science	The student will investigate and understand scientific concepts related to the origin and evolution of the universe.	nebulae	591 633 639 640 642 652	characteristics of the universe what is a star? death of small to medium stars results in white dwarfs and planetary nebula and black dwarfs death of massive stars results in supernovas and neutron stars and black holes what is a galaxy? research and describe astronomical objects	264	using spectroscopy to analyze the light emitted by stars and identify most common elements
ES14.b	Earth Science	The student will investigate and understand scientific concepts related to the origin and evolution of the universe.	the origin of stars and star systems.	638 639 639 640 640	the life cycle of stars death of small to medium stars results in white dwarfs and planetary nebula and black dwarfs description and illustration of the life cycle of stars death of massive stars results in supernovas and neutron stars and black holes elements formed by nuclear fusion in stars	255 264	observe and describe the appearance of the moon and Jupiter and its moons using spectroscopy to analyze the light emitted by stars and identify most common elements

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
ES14.c	Earth Science	The student will investigate and understand scientific concepts related to the origin and evolution of the universe.	stellar evolution	638	the life cycle of stars	255	observe and describe the appearance of the moon and Jupiter and its moons
				639	death of small to medium stars results in white dwarfs and planetary nebula and black dwarfs	264	using spectroscopy to analyze the light emitted by stars and identify most common elements
				639	description and illustration of the life cycle of stars		
				640	death of massive stars results in supernovas and neutron stars and black holes		
				640	elements formed by nuclear fusion in stars		
ES14.d	Earth Science	The student will investigate and understand scientific concepts related to the origin and evolution of the universe.	galaxies	591	characteristics of the universe		
				633	what is a star?		
				642	what is a galaxy?		
				643	the structure of the Milky Way Galaxy		
				652	research and describe astronomical objects		

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<b>Standard #:</b>	<b>Subject</b>	<b>Standard</b>	<b>Key Concept</b>	<b>student text pg</b>	<b>detail</b>	<b>investigation pg</b>	<b>detail</b>
ES14.e	Earth Science	The student will investigate and understand scientific concepts related to the origin and evolution of the universe.	cosmology (the Big Bang)	611	historical theories of the origin of the moon		
				612	historical theories about the solar system		
				621	historical theories of which objects were planets		
				647	the Big Bang theory of the origin of the universe		
				648	evidence for the Big Bang theory		
				649	evidence for the Big Bang theory		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS01.a	Physical Science	The student will plan and conduct investigations in which:	chemicals and equipment are used safely	452	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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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						216 safety in swinging thermometers	
						256 safety in lab	

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS01.b	Physical Science	The student will plan and conduct investigations in which:	length, mass, volume, density, temperature, weight, and force are accurately measured and reported using the SI system	5	measuring distance	5	making measurements with precision
				5	make measurements with precision	5	measuring metric and english lengths
				6	scientists use metric units	6	measure time
				19	convert from english to metric	7	measure and record variables
				78	use and understand mass measurements	12	make metric length measurement
				280	measuring volume of liquids	16	understand and use units of force
				280	measuring volume of solids	16	measure force
				629	converting light years to astronomical units	17	measure the force
						17	measure the force
						25	measure and record the force
						30	measure height difference
						36	make precise height measurements
						44	measure voltage
						46	measure current
						48	measure resistance
						63	making measurements with precision
						75	make precise length measurements
						87	measure wavelength

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						116 measure mass 116 measuring mass 117 measure volume 117 measuring volume 176 measure pH 186 measure temperature	
PS01.c	Physical Science	The student will plan and conduct investigations in which:	conversions are made among metric units applying appropriate prefixes		featured throughout CPO Science program featured in ancillary component	featured throughout CPO Science program featured in ancillary component	
				18	perform dimensional analysis calculations	258	determining scale distances
				592	unit conversion in calculating light years		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS01.d	Physical Science	The student will plan and conduct investigations in which:	triple beam and electronic balances, thermometers, metric rulers, graduated cylinders, and spring scales are used to gather data	24	featured throughout CPO Science program using an electronic timer	7 12 14 16 17 18 30 44 46 48 50 158	featured throughout CPO Science program use a ruler to make a measurement using photogates using photogates use a force scale use photogates to study car on ramp use a balance to find mass of car use force scale using electrical meter using electrical meter using electrical meter using electrical meter use a thermometer

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS01.e	Physical Science	The student will plan and conduct investigations in which:	numbers are expressed in scientific notation where appropriate	590	featured in ancillary component astronomic numbers expressed in scientific notation	271	featured in ancillary component calculating solar brightness units (SBU) from kilometers in scientific notation
				592	calculating light year using scientific notation		
				601	converting numbers to scientific notation		
				606	determining Earth's mass using scientific notation		
PS01.f	Physical Science	The student will plan and conduct investigations in which:	research skills are utilized using a variety of resources	110	research Franklin's electricity experiments	130	investigate Rutherford's gold foil experiment
				313	development of atomic theory	177	research pH indicators
				324	research and create a poster to illustrate development of atomic model	180	researching where your water comes from
						201	researching the causes of ozone
				370	research Lavoisier's contributions	207	researching how bodies of water affect climate
				400	research the Clean Air Act of 1970 and 1990	222	researching an animal that is adapted to live in the biome you studied
				448	research local water supply history	227	researching forensic science
				468	research the history of heat and temperature		
				627	research space solar power		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS01.g	Physical Science	The student will plan and conduct investigations in which:	independent and dependent variables, constants, controls, and repeated trials are identified	11	featured throughout CPO Science program	7	featured throughout CPO Science program
				11	control and experimental variables	7	doing a controlled experiment
				12	writing lab procedures	7	variables in an experiment
				26	independent and dependent variables	7	perform your own experiment
				28	identifying cause and effect relationships	10	conduct car/ramp experiment
				41	identify cause and effect	16	investigate Newton's 2nd law
				438	what causes acid rain	21	choose independent and dependent variables for graph
				448	forming a hypothesis and testing through experimentation (#5)	21	determine effect of increasing mass
				456	determining effect of changing mass on temperature changes	27	recognize variables
				460	thermal equilibrium	34	investigate motion on a rollercoaster
				497	factors that shape the weather	75	perform self-designed experiment
				602	identify question, hypothesis, procedure, and results (#1)	170	write a procedure
				608	relationship between orbital speed and distance between two objects	182	simulating the effect of acid rain on daphnia
						188	conducting investigation of efficiency of immersion heater

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						190	effect of changing mass on collected data
						190	effect of changing mass on data
						193	conducting experiments on heat transfer
						196	writing a procedure for constructing a pointer for an aneroid barometer
						197	identifying relationships between air pressure and weather
						205	investigating how specific heat of water regulates Earth's temperature
						206	identifying relationship between percent of Earth covered in water and temperature range
						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
						224	sequencing events

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<b>Standard #:</b>	<b>Subject</b>	<b>Standard</b>	<b>Key Concept</b>	<b>student text pg</b>	<b>detail</b>	<b>investigation pg</b>	<b>detail</b>
						235	concluding which conditions affect the timing and duration and intensity of an earthquake based on observation
						241	justify which scenario was most likely
						256	investigation discovering relationship between orbital speed and distance

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS01.h	Physical Science	The student will plan and conduct investigations in which:	data tables showing the independent and dependent variables, derived quantities, and the number of trials are constructed and interpreted			9 construct a data table 12 understand and use data table 17 record results in data table 18 organize different combinations of data 24 use data table to record results 27 use data table to record results 30 record ropes and pulley data in table 36 organize data into a table 75 create data table for self-designed experiment 151 design a data table 171 use data table for observations 181 organize water quality data into a table	

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS01.i	Physical Science	The student will plan and conduct investigations in which:	data tables for descriptive statistics showing specific measures of central tendency, the range of data set, and the number of repeated trials are constructed and interpreted	547	average density (#5)	9	construct a data table
				618	average distance from the sun	12	understand and use data table
						17	record results in data table
						18	organize different combinations of data
						24	use data table to record results
						27	use data table to record results
						30	record ropes and pulley data in table
						36	organize data into a table
						75	create data table for self-designed experiment
						129	find average velocity
						151	design a data table
						171	average dissolving rate
						171	use data table for observations
						181	organize water quality data into a table

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS01.j	Physical Science	The student will plan and conduct investigations in which:	frequency distributions, scattergrams, line plots, and histograms are constructed and interpreted	24	making a graph	11	draw best fit curve
				26	drawing a best fit curve	11	use your graph to predict speed
				26	creating graphs	13	draw best fit curve
				31	determining slope of a line	13	graph distance vs. time
				38	determining slope of a line	15	construct a quantitative graphical model
				41	make a graph	15	calculating acceleration from the slope of the line
						37	organize data into a graph of speed vs. height
						51	graph voltage vs. current
						121	graph mass vs. volume
						147	organize observations into a category table
						185	constructing a graph of drops of acid vs pH
						187	find slope of a trend line
						187	draw a line of best fit through temperature data points
						187	construct a graphical model
						189	construct a temperature vs. time graph
						189	calculate slope of a graph

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						197 graphing and drawing a trend line for atmospheric pressure data 197 constructing a graph from atmospheric pressure data 203 graphing water and ice temperature readings 206 constructing a graph of time vs. temperature	
PS01.k	Physical Science	The student will plan and conduct investigations in which:	valid conclusions are made after analyzing data		featured throughout CPO Science program	featured throughout CPO Science program 21 construct reasonable explanation based on data 35 study data and determine importance of height on speed of marble 45 analyze data and explain a rule 157 add new rules to list based on findings 197 evaluating your aneroid barometer design	

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS01.I	Physical Science	The student will plan and conduct investigations in which:	research methods are used to investigate practical problems and questions	7	featured throughout CPO Science program	6	featured throughout CPO Science program
				9	experimentation begins with a question	7	how do we ask questions and get answers from nature?
				10	steps in the scientific method	7	perform your own experiment
				10	the research question and hypothesis	7	design your own experiment
				10	forming a hypothesis	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
				42	devise an experiment	16	decide how to vary the force on the car for this experiment
				429	why haven't we run out of water	16	investigate Newton's 2nd law
				434	what is in your tap water	26	what variables can be changed?
				437	what is acid rain	34	investigate motion on a rollercoaster
				441	why are oceans salty	75	perform self-designed experiment
				448	describe steps you would take to determine whether pH affects frog population	75	plan three experiments to determine which variable affects the period of a pendulum
				456	asking questions pertaining to specific heat and heat flow		
				472	why is Earth's atmosphere different from other planets		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				473	why do ears pop	75	design pendulum experiment
				492	why does Earth have seasons	93	decision trees and the advantage of doing multiple trials
				501	how does rain form		
				509	how do animals survive in the desert	101	how could you extend the investigation to explore materials that give off light when heated?
				515	what is a carbon sink		
				530	proving hypotheses for sea-floor spreading	117	how could you find the volume of one drop of water?
				534	why doesn't Earth get bigger and bigger		
				580	form a hypothesis (#7)	151	design experiment to find out if mass is conserved
				588	what causes eclipses	170	what three factors influence dissolving rate?
				621	is Pluto a planet	170	which factor will produce fastest dissolving rate?
						170	devise hypothesis and explain
						182	formulate hypothesis
						182	simulating the effect of acid rain on daphnia
						183	specifying how the daphnia experiment could be improved
						188	conducting investigation of efficiency of immersion heater

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
						193 conducting experiments on heat transfer 205 investigating how specific heat of water regulates Earth's temperature 208 formulate a hypothesis about why the seasons occur 233 identifying how the earthquake model represents an earthquake 237 develop a research plan for studying volcanoes	
PS01.m	Physical Science	The student will plan and conduct investigations in which:	experimental results are presented in appropriate written form		featured throughout CPO Science program	featured throughout CPO Science program 9 reporting on an experiment 179 create water quality report 181 write paragraph to explain results 183 write summary of findings	

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS01.n	Physical Science	The student will plan and conduct investigations in which:	an understanding of the nature of science is developed and reinforced		featured throughout CPO Science program		featured throughout CPO Science program
				23	why make models?	6	asking questions and learning about natural world
				24	scientific models		
				24	what is a scientific model?	202	modeling the effect of greenhouse gases on Earth's temperature
				473	why do ears pop		
				485	computer modeling to predict greenhouse effects	212	modeling underwater rivers and waterfalls and springs
				494	modeling air currents		
				504	meteorologists use atmospheric pressure data to understand movement of weather systems	215	the food paradox of the oceans
						232	construct a model that simulates an earthquake
				518	create a model (#1)	258	setting up a scale model of the solar system
				524	model of Earth's history		
				533	modeling plate boundaries		
				576	rock cycle model		
				614	solar system modeling		
				624	model of the sun's anatomy		
				648	evidence for Big Bang theory		

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<b>Standard #:</b>	<b>Subject</b>	<b>Standard</b>	<b>Key Concept</b>	<b>student text pg</b>	<b>detail</b>	<b>investigation pg</b>	<b>detail</b>
PS02.a	Physical Science	The student will investigate and understand the basic nature of matter	the particle theory of matter		featured throughout CPO Science program		featured throughout CPO Science program
				311	all matter is formed from atoms	132	comparing atoms
				311	all matter is formed from atoms		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS02.b	Physical Science	The student will investigate and understand the basic nature of matter	elements, compounds, mixtures, acids, bases and salts	278	mixtures can be separated by physical means	114	investigating a mixture
				278	pure substances cannot be separated by physical means	114	separating a homogeneous mixture
				279	summary of matter classification	114	investigate a homogeneous mixture
				283	atoms and molecules	141	compare and contrast elements and compounds
				288	create a poster of matter classification	169	investigate solutions and colloids and suspensions
				407	solutions are mixtures	176	investigate acids and bases
				408	colloids and suspensions	176	measure pH of everyday solutions
				417	properties of acids	181	testing pH of tap water samples
				417	H and OH ions	184	determining pH of water as carbon dioxide dissolves
				417	define and compare acids and bases		
				417	acids and bases compared/contrasted		
				418	formulas and reactions of acids and bases		
				418	properties of bases		
				420	concentration of hydronium ions determines pH and strength of acids and bases		
				420	pH and pH scale		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				420	defining and determining pH		
				421	pH of substances you use or consume		
				421	table of pH of common substances		
				422	examples of acid and base chemistry		
				422	pH and blood		
				426	mixtures and emulsifying agents		
				437	pH of acid rain		
				437	concentration of ions and pH		
PS02.c	Physical Science	The student will investigate and understand the basic nature of matter	solids, liquids, and gases	284	states of matter and arrangement of molecules	118	observe melting process and study quantitatively
				284	changes of state	118	investigate melting
				285	characteristics of matter related to its state	118	molecules in a liquid
				405	molecular structure of ice	118	think of melting process at molecular level
				498	phases changes in the atmosphere	119	energy and phase changes

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PS02.d	Physical Science	The student will investigate and understand the basic nature of matter	characteristics of types of matter based on physical and chemical properties	294	development of Kevlar brand fiber	146	investigate and observe chemical and physical changes in the lab
				353	physical and chemical changes and digestion		
				355	physical and chemical changes in tire recycling		
				372	determine if changes are chemical or physical		
				457	engineers use specific heat of substances to design better products		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS02.e	Physical Science	The student will investigate and understand the basic nature of matter	physical properties (shape, density, solubility, odor, melting point, boiling point, color)	281	volume and mass contrasted	116	mass and volume measurements
				284	melting and boiling point explained	119	melting point of ice
				284	melting and boiling points	124	build a density column
				285	table of melting and boiling points	126	investigating buoyancy with clay boats
				291	density explained	128	use CPO viscometer to study viscosity
				291	density is independent of amount of substance	212	investigate density changes in the oceans as the cause of ocean layering
				292	elasticity is a physical property of matter		
				292	hardness is a physical property of matter		
				293	brittleness is a physical property of matter		
				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 #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				305	viscosity of glue mixtures		
PS02.f	Physical Science	The student will investigate and understand the basic nature of matter	chemical properties (acidity, basicity, combustibility, reactivity)	357 361 417 417	combustion reaction heartburn reaction define and compare acids and bases acids and bases compared/contrasted	176	investigate acids and bases
PS03.a	Physical Science	The student will investigate and understand the modern and historical models of atomic structure	the contributions of Dalton, Thomson, Rutherford and Bohr in understanding the atom	313 324	development of atomic theory research and create a poster to illustrate development of atomic model	130	investigate Rutherford's gold foil experiment

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PS03.b	Physical Science	The student will investigate and understand the modern and historical models of atomic structure	the modern model of atomic structure	311	location/size/charge of subatomic particles	132	atomic number determines what element that atom is
				311	protons/neutrons/electrons	132	building atom models
				315	atoms of same element have same atomic number	133	protons and neutrons
				318	proton/electron attraction	133	location of electrons in atom
				388	showing valence electrons in a diagram	136	model stable and neutral atoms
						137	importance of atomic number
						137	build atomic models
						140	find the number of electrons in outermost level
						140	review subatomic particles

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS04.a	Physical Science	The student will investigate and understand the organization and use of the periodic table of elements to obtain information.	symbols, atomic numbers, atomic mass, chemical families (groups), and periods	315 316 320 321 322 322 322 322	atomic number discussed mass number discussed groups of elements studying the periodic table atomic mass on the periodic table mass number on the periodic table atomic number on the periodic table chemical symbols and element names	133 133 133 133 136 136 136	using the periodic table identify atomic number identify mass number identify element symbol and name building and studying the periodic table mass number atomic number
PS04.b	Physical Science	The student will investigate and understand the organization and use of the periodic table of elements to obtain information.	classification of elements as metals, metalloids, and nonmetals	332	metals nonmetals and metalloids		
PS04.c	Physical Science	The student will investigate and understand how to use the periodic table of elements to obtain information.	simple compounds (formulas and nature of bonding)	324 324 332 335	which element is more likely to combine with other elements? use the periodic table to predict chemical formulas metals nonmetals and metalloids chemical bonding and the periodic table	141	modeling a chemical bond

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS05.a	Physical Science	The student will investigate and understand changes in matter and the relationship of these changes to the Law of Conservation of Matter and Energy	physical changes	284 498	changes of state phases changes in the atmosphere	119	energy and phase changes
PS05.b	Physical Science	The student will investigate and understand changes in matter and the relationship of these changes to the Law of Conservation of Matter and Energy	nuclear reactions (products of fusion and fission and their effects on human beings and the environment)	387 388 393 393 400 623	fusion and fission explained nuclear vs chemical reactions radioisotopes in science and medicine carbon dating research pros and cons of nuclear technology nuclear fusion and the sun	138 138 160 160 161	fusion and fission nuclear reactions radioactive decay how do you simulate nuclear decay? research pros and cons of uses for radioactive elements

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS05.c	Physical Science	The student will investigate and understand changes in matter and the relationship of these changes to the Law of Conservation of Matter and Energy	chemical changes (types of reactions, reactants and products, and balanced equations)	336	writing chemical formulas	148	reactants and products
				354	new substances are formed when a chemical change occurs	149	balance these equations
				357	chemical reactions involve rearrangement of atoms	149	practice balancing equations
				359	balancing chemical equations	152	write the balanced equation
				361	chemical reactions in living systems	152	predict how much product formed given the reactants
				363	history of law of conservation of mass	155	calculating product yield
				368	predicting amount of product	156	investigate double displacement reactions
				371	which of the equations is balanced?	157	predict the products of double displacement reactions
				375	synthesis or addition reactions	158	investigate energy changes in chemical reactions
				376	decomposition reactions	162	investigating combustion reactions
				377	single displacement reactions		
				377	double displacement reactions		
				378	consumer chemistry		
				378	combustion reactions		
				381	MRE ration heater reaction		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				381	exothermic reactions and MREs		
				382	endothermic reactions and cold packs		
				395	chemistry of the atmosphere		
				395	chemistry of the atmosphere		
				397	carbon reactions		
				438	chemical reactions and the formation of acid rain		
PS06.a	Physical Science	The student will investigate and understand states and forms of energy and how energy is transferred and transformed	potential and kinetic energy	91	following an energy transformation	38	identify potential/kinetic energy conversions
				537	potential energy transformed to kinetic energy causes earthquakes		
PS06.b	Physical Science	The student will investigate and understand states and forms of energy and how energy is transferred and transformed	mechanical, chemical, and electrical energy	91	following an energy transformation	39	make an energy flow chart
				623	energy from the sun		
				626	harnessing the sun's energy		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS06.c	Physical Science	The student will investigate and understand states and forms of energy and how energy is transferred and transformed	heat, light, and sound	91	understand basic forms of energy	39	identify type of energy involved
PS07.a	Physical Science	The student will investigate and understand temperature scales, heat, and heat transfer	Celsius and Kelvin temp. scales and absolute zero	453 454 454 460 460	comparing temperature in Fahrenheit and Celsius scales changes in temperature are directly related to changes in energy temperature and thermal energy and heat thermal equilibrium thermal equilibrium	119 186 188 188	investigate temperature and energy transfer in melting process develop a way to convert between Fahrenheit and Celsius temperature scales investigate the increase of temperature of water as thermal energy is added relationship between heat and temperature
PS07.b	Physical Science	The student will investigate and understand temperature scales, heat, and heat transfer	phase change, freezing point, boiling point, vaporization, and condensation	284 284 285 406	melting and boiling point explained melting and boiling points table of melting and boiling points hydrogen bonding and the gaseous state of water	119 119 204 204	melting point of ice create a temperature vs. time graph of phase change compare the shape of the water line and the ice line on the temperature/time graph investigating latent heat and thermal buffering

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS07.c	Physical Science	The student will investigate and understand temperature scales, heat, and heat transfer	conduction, convection, and radiation	462 462 463 463 464 465 465 482 493	densely packed solids are good conductors of heat heat transfer through air convection currents and weather warming hands over candle convection currents in water transfer of heat by radiation solid road surface emits radiation global warming and heat transfer by radiation apply knowledge of heat transfer to different situations	192	investigate convection in liquids
PS07.d	Physical Science	The student will investigate and understand temperature scales, heat, and heat transfer	applications of heat transfer (heat engines, thermostats, refrigeration and heat pumps)	455 461	examples of flow of heat conduction and convection and radiation	188	investigate heating water with an immersion heater

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS08.a	Physical Science	The student will investigate and understand characteristics of sound and technological applications of sound waves	wavelength, frequency, speed and amplitude	179 182 182 192 221	what is a cycle? concept of frequency explained concept of period explained analyze systems to find cycle/period/frequency importance of wavelength of sound waves	83 86	find speed of a wave adjust frequency of a standing wave
PS08.b	Physical Science	The student will investigate and understand characteristics of sound and technological applications of sound waves	resonance	204 210	resonance explained natural frequency of a building and earthquakes	87 88 96	investigating resonance natural frequency and resonance of standing waves on a string investigating sound resonance
PS08.c	Physical Science	The student will investigate and understand characteristics of sound and technological applications of sound waves	the nature of mechanical waves	198 215 242 480 538	frequency and wavelength and amplitude properties of sound waves properties of light waves electromagnetic radiation body waves	83 86	measure speed of a wave pulse investigate frequency and wavelength

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS08.d	Physical Science	The student will investigate and understand characteristics of sound and technological applications of sound waves	technological applications of sound	220	white noise	90	investigate human perception of sound
				220	sonograms	98	investigate sound and music
				220	voice recognition programs		
				226	musical instruments		
PS09.a	Physical Science	The student will investigate and understand the nature and technological applications of light	the wave behavior of light (reflection, refraction, diffraction, and interference)	258	refraction in optical systems	106	tracing incident and reflected rays
				258	forming images with lenses	106	investigate reflection of light
				260	reflection and mirrors	107	investigate how light interacts with mirrors
				263	index of refraction	107	plot reflected rays from a mirror
				263	index of refraction	108	tracing incident and refracted rays
				273	find the angle of reflection	108	explore refraction with lenses
				480	absorption and emission	108	investigate how light interacts with a prism
						110	finding focal point and focal length of a lens
						111	plotting images formed when light is refracted by a lens
						253	using a retractable telescope

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS09.b	Physical Science	The student will investigate and understand the nature and technological applications of light	images formed by lenses and mirrors	258	forming images with lenses	107 108 108 110 111 253	investigate how light interacts with mirrors explore refraction with lenses investigate how light interacts with a prism finding focal point and focal length of a lens plotting images formed when light is refracted by a lens using a retractable telescope
PS09.c	Physical Science	The student will investigate and understand the nature and technological applications of light	electromagnetic spectrum	196 237 237 237 250 272	waves are all around us microwave ovens radio and television signals visible light and the electromagnetic spectrum identify uses of electromagnetic waves identify uses of electromagnetic waves	134	investigating visible light with a spectrometer

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS10.a	Physical Science	The student will investigate and understand scientific principles and technological applications of work, force, and motion	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	calculate speed of car	10	calculate speed of the car
				20	find speed of bumblebee	12	calculate speed of moving car
				24	accurate speed measurements	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	17	explore 2nd law and acceleration
				37	speed vs. time graphs	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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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS10.b	Physical Science	The student will investigate and understand scientific principles and technological applications of work, force, and motion	Newton's 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 first law in detail	19	discover 2nd law of motion
				49	force is related to acceleration	19	find correct relationship between force mass and acceleration
				49	Newton's second law in detail	20	force and motion with car and ramp
				51	balanced and unbalanced forces	22	car and ramp and Newton's 3rd law
				59	Newton's third law in detail	23	using 3rd law to explain common phenomena
64	solving problems using $f=ma$						

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS10.c	Physical Science	The student will investigate and understand scientific principles and technological applications of work, force, and motion	work, force, mechanical advantage, efficiency and power	46	force has potential to change motion	19	find correct relationship between force mass and acceleration
				49	force is related to acceleration	24	measure force in newtons
				68	compound machines	29	design and construct complex gear machines
				69	newtons and pounds	31	calculate work done on block
				83	how to calculate work	31	work = force X distance
				85	efficiency explained	191	calculating work input and work output
				85	efficiency and bicycles	191	find efficiency of water heater
				86	how to calculate power	191	power of an immersion heater
				86	power explained	191	calculate the power output of a photovoltaic cell
				87	concept of energy as stored work		
				96	calculate work done		
				96	decide whether or not work is done		
				97	calculate power of two different machines		
				97	calculate power		
				97	analyze power of motor		
				97	calculate work accomplished by a motor		
				97	calculate work output from efficiency data		
				97	find the efficiency of a machine		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				97	compare different amounts of work done		
				138	how to calculate electrical power		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS10.d	Physical Science	The student will investigate and understand scientific principles and technological applications of work, force, and motion	applications (simple machines, compound machines, powered vehicles, rockets and restraining devices	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	pliers as an example of a lever	30	exploring force and distance with ropes and pulleys
				71	parts of a lever		
				71	how a lever works	31	work output vs. work input
				71	the human body and simple machines		
				72	mechanical advantage of a lever		
				75	how gears work		
				78	set up a lever with MA greater than 1		
				78	design a toothbrush		
				79	analyze block and tackle		
				79	calculate mechanical advantage		
				79	analyze pulleys with different numbers of supporting strings		
				80	analyze wheelbarrow		
				80	analyzing the jaw as a lever		

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<b>Standard #:</b>	<b>Subject</b>	<b>Standard</b>	<b>Key Concept</b>	<b>student text pg</b>	<b>detail</b>	<b>investigation pg</b>	<b>detail</b>
				80	analyze block and tackle machine on a sailboat		
				84	work input and output		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
PS11.a	Physical Science	The student will investigate and understand basic principles of electricity and magnetism	static, current, circuits	101	concept of electric current	42	investigate electric charge
				102	concept of electric circuits	44	investigate concept of voltage
				103	circuit diagrams	45	battery chemicals and electrical charge
				105	charge is a fundamental property of matter	46	investigate concept of electric current
				106	static charge discussed	48	measuring resistance
				107	explanation of coulomb	50	Ohm's law
				108	how an electroscope works	56	build a parallel circuit
				108	electroscopes	56	build a series circuit
				113	battery uses chemical energy to produce electrical charge	57	compare brightness of bulbs in series vs. parallel
				114	voltage and potential energy	58	build a series circuit and find total resistance
				115	how to measure voltage	60	parallel circuit and Ohm's law
				117	electrical current explained	61	compare current and voltage and resistance in each type of circuit
				119	how to measure current		
				123	understand the concept of electrical resistance		
				131	Ohm's law explained		
				132	using Ohm's law to analyze circuits		
				136	potentiometer explained		
				145	holiday lights as series or parallel		

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Standard #:	Subject	Standard	Key Concept	student text pg	detail	investigation pg	detail
				145	single path vs. branching paths		
				145	parallel circuit defined		
				145	series circuit defined		
				146	household wiring		
				147	current and voltage in series circuits		
				151	voltage and resistance in parallel circuits		
				155	analyze a parallel circuit		
				156	analyze a series circuit		
PS11.b	Physical Science	The student will investigate and understand basic principles of electricity and magnetism	magnetic fields and electromagnets	159	magnetism explained	62	describing forces that magnets exert on each other
				163	understanding magnetic fields	64	testing materials to see if they are affected by magnets
				164	what is an electromagnet?		
				166	building an electromagnet	66	compare electromagnets and permanent magnets
				166	increased current vs. strength of magnetic field	66	build an electromagnet
				171	electromagnetic induction explained	67	find out what happens to strength of electromagnet when current is increased
						73	exploring electric generators
						73	use magnetic induction to create an electric field

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<b>Standard #:</b>	<b>Subject</b>	<b>Standard</b>	<b>Key Concept</b>	<b>student text pg</b>	<b>detail</b>	<b>investigation pg</b>	<b>detail</b>
PS11.c	Physical Science	The student will investigate and understand basic principles of electricity and magnetism	motors and generators	168 170	how electric motors work dissecting an electric motor	68	investigate how an electric motor works