

**Correlation to Pennsylvania Academic Standards for Science
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.2.10.A1	Inquiry and Design	Apply knowledge and understanding about the nature of scientific and technological knowledge.	Compare and contrast scientific theories and beliefs.	10	process of reviewing hypothesis explained	35	what evidence is there in support of your hypothesis?
				34	Aristotle vs. Newton	39	critique group's explanation of energy transformations
				45	Newton's Laws of Motion	39	review energy theory in context of everyday scenarios
				54	Newton and the force of gravity	39	analyze energy transformations in different scenarios
				73	impact of Da Vinci's work	77	show how energy loss data could be applied to designing a real clock
				105	Benjamin Franklin	77	compare law of conservation of energy to motion of pendulum
				107	Charles-Augustin Coulomb	151	review your hypothesis
				320	the quests of alchemists	171	did you prove or disprove your hypothesis?
				391	scientific discovery and the atomic age	198	contributions of Schönbein
				521	relative dating and modern geology based on Steno's theories		
				524	Kelvin's calculations of Earth's age		
				528	theory of plate tectonics		
				529	critiquing Wegener's theories of continental drift		
				563	Darwin's theories of the Andes formation		
				566	what causes ice ages		
				583	history of calendars		
				585	counting the days in a year		

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				586	the history of clocks and the division of time		
				589	ancient beliefs about solar eclipses		
				594	history of the telescope		
				611	theories of origin of the moon		
				612	early theories of the solar system		
				647	Big Bang theory		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.2.10.A2	Inquiry and Design	Apply knowledge and understanding about the nature of scientific and technological knowledge.	Know that science uses both direct and indirect observation means to study the world and the universe.	20	finding variability in data	14	record three different time intervals
				79	look at force data and decide the usefulness of a machine	18	use data to describe relationship between force and motion
				372	observe chemical changes	19	use data to infer correct relationship between variables
				435	making observations and asking questions	25	collect force data
				486	observing an aurora	27	write down the number of weights you use
				630	what evidence was used to predict the existence of the Kuiper Belt?	30	interpret block and tackle data
				630	use the data to answer the questions	100	observe glow-in-the-dark paper
				652	analysis with a spectrometer (#4)	141	build models of Na and Cl and use them to explain bonding
						146	observe evidence of chemical change
						146	record detailed observations
						150	record data as you perform experiment
						158	observe temperature changes in chemical reactions
						169	observe Tyndall effect
						172	observe dissolving process

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
						179	make observations about local surface water
						182	observing daphnia and recording movements and behavior
						182	making hypotheses and testing them against observations
						185	analyzing the results of the buffered acid experiment
						186	sensing temperature with fingers
						192	observe convection currents
						192	observing forced convection through liquids
						193	explaining efficiency of heat transfer based on data
						199	collecting Schönbein strips for detecting ozone
						202	using your hand to sense temperature differences
						202	collecting data of temperature and sensations
						206	collecting temperature and time data

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
						210 collecting qualitative data of light intensity at scale distance from the sun 217 collecting wet and dry bulb temperature readings 224 reconstruct a series of events from clues 235 interpreting how the drumming affects the intensity of the earthquake in the model 243 recording observations of crystal growing 251 recording the changes in the moon over a month	
3.2.10.A3	Inquiry and Design	Apply knowledge and understanding about the nature of scientific and technological knowledge.	Integrate new information into existing theories and explain implied results.			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 #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.2.10.B1	Inquiry and Design	Apply process knowledge and organize scientific and technological phenomena in varied ways.	Describe materials using precise quantitative and qualitative skills based on observations.	5	make measurements with precision	4	difference between precise and accurate data
				12	importance of reliable and accurate data collection	5	making measurements with precision
				435	making observations and asking questions	6	electronic timer and release technique
				486	observing an aurora	7	measure and record variables
				630	what evidence was used to predict the existence of the Kuiper Belt?	7	record time interval
						9	collect speed data
				630	use the data to answer the questions	14	record three different time intervals
				652	analysis with a spectrometer (#4)	17	measure the force
						17	measure the force
						17	record times
						24	collect weight data
						25	collect force data
						25	measure and record the force
						27	write down the number of weights you use
						30	measure height difference
						36	make precise height measurements
						36	collect precise speed and height data

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
						63	making measurements with precision
						75	collect mass and amplitude data
						75	make precise length measurements
						146	record detailed observations
						150	record data as you perform experiment
						171	collect time data and record observations
						176	measure pH
						182	making detailed observations
						182	observing daphnia and recording movements and behavior
						184	collecting pH readings while adding carbon dioxide
						186	collecting temperature data
						189	collecting time and temperature data
						193	collecting and recording time and temperature data
						199	collecting Schönbein strips for detecting ozone

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						202	collecting data of temperature and sensations
						206	collecting temperature and time data
						210	collecting qualitative data of light intensity at scale distance from the sun
						217	collecting wet and dry bulb temperature readings
						243	recording observations of crystal growing
						249	using your sundial to collect accurate data
						251	recording the changes in the moon over a month
						253	calibrating your telescope

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.2.10.B2	Inquiry and Design	Apply process knowledge and organize scientific and technological phenomena in varied ways.	Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions.	7	experimentation begins with a question	6	predict which car will move fastest
				9	steps in the scientific method	6	how do we ask questions and get answers from nature?
				10	the research question and hypothesis	7	compare results with hypothesis
				10	forming a hypothesis	7	design your own experiment
				11	control and experimental variables	7	test the effect of one other variable
				12	writing lab procedures	7	perform your own experiment
				19	design your own experiment	7	variables in an experiment
				19	design your own experiment	7	doing a controlled experiment
				20	finding variability in data	9	design three experiments and choose equipment
				26	independent and dependent variables	9	conduct three experiments with appropriate equipment
				28	identifying cause and effect relationships	9	design three experiments and choose equipment
				41	identify cause and effect	9	devise a hypothesis
				42	devise an experiment	9	design three experiments using car and ramp
				79	look at force data and decide the usefulness of a machine	9	devise a hypothesis
				288	find the thickness of a single card	9	design three experiments using car and ramp
				429	why haven't we run out of water	10	conduct car/ramp experiment

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				434	what is in your tap water	10	selecting ramp and photogates
				437	what is acid rain		
				438	what causes acid rain	12	select equipment and set up experiment
				441	why are oceans salty	16	decide how to vary the force on the car for this experiment
				448	forming a hypothesis and testing through experimentation (#5)	16	investigate Newton's 2nd law
				448	describe steps you would take to determine whether pH affects frog population	18	use data to describe relationship between force and motion
				451	what is temperature	19	use data to infer correct relationship between variables
				456	determining effect of changing mass on temperature changes	21	choose independent and dependent variables for graph
				456	asking questions pertaining to specific heat and heat flow	21	determine effect of increasing mass
				460	thermal equilibrium	26	what variables can be changed?
				472	why is Earth's atmosphere different from other planets	27	think about the variables
				473	why do ears pop	27	recognize variables
				492	why does Earth have seasons	30	interpret block and tackle data
				497	factors that shape the weather	30	rigging block and tackle
				501	how does rain form	34	where does the marble move the fastest?

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				509	how do animals survive in the desert	34	investigate motion on a rollercoaster
				515	what is a carbon sink	43	how did A and B tapes acquire different charge?
				530	proving hypotheses for sea-floor spreading	75	investigate variables that affect the period of a pendulum
				534	why doesn't Earth get bigger and bigger	75	perform self-designed experiment
				580	form a hypothesis (#7)	75	design pendulum experiment
				588	what causes eclipses	75	plan three experiments to determine which variable affects the period of a pendulum
				602	identify question, hypothesis, procedure, and results (#1)	93	decision trees and the advantage of doing multiple trials
				608	relationship between orbital speed and distance between two objects	141	build models of Na and Cl and use them to explain bonding
				621	is Pluto a planet	145	carry out procedure and select equipment
						145	plan a procedure and select necessary equipment
						151	select materials from list
						151	plan procedures and select materials

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						151	perform the experiment you designed
						151	explain how hypothesis compares to results
						151	design experiment to find out if mass is conserved
						157	add new rules to list based on findings
						170	what three factors influence dissolving rate?
						170	which method will give fastest dissolving rate?
						170	which factor will produce fastest dissolving rate?
						170	devise hypothesis and explain
						170	devise hypothesis and explain
						170	write a procedure
						182	making hypotheses and testing them against observations
						182	simulating the effect of acid rain on daphnia
						182	formulate hypothesis
						185	analyzing the results of the buffered acid experiment

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
						188	conducting investigation of efficiency of immersion heater
						190	effect of changing mass on collected data
						190	effect of changing mass on data
						193	explaining efficiency of heat transfer based on data
						193	conducting experiments on heat transfer
						194	design and construct an aneroid barometer
						196	writing a procedure for constructing a pointer for an aneroid barometer
						197	evaluating your aneroid barometer design
						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

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						208	formulate a hypothesis about why the seasons occur
						208	testing hypothesis of why seasons occur against your observations in the investigation
						209	measuring the intensity of light using an electric meter and solar cell and light bulb
						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	reconstruct a series of events from clues
						224	sequencing events
						233	identifying how the earthquake model represents an earthquake
						235	concluding which conditions affect the timing and duration and intensity of an earthquake based on observation

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
						235	interpreting how the drumming affects the intensity of the earthquake in the model
						237	develop a research plan for studying volcanoes
						241	justify which scenario was most likely
						252	identifying the parts of a refracting telescope and making observations of the moon's surface
						256	investigation discovering relationship between orbital speed and distance

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3.2.10.B3	Inquiry and Design	Apply process knowledge and organize scientific and technological phenomena in varied ways.	Use process skills to make inferences and predictions using collected information and to communicate, using space / time relationships, defining operationally.	20	how will speed change?	25	create a mathematical model
				24	predicting speed from a graph	27	find math rule for lever equilibrium
				42	predict the speed of a car	28	derive a math formula
				42	interpreting distance/time graph	76	use data to predict best string length for a pendulum clock
				459	heat equation	121	use graph to predict mass of six objects
				645	inverse square law	151	does your experiment agree with law of conservation of mass?
						156	make predictions about solubility
						187	find equation for trend line
						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
						231	evaluating your completed bathymetric map
						239	estimating the number of meteor collisions on Earth during the last 3.5 billion years

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						242 predicting the results of the crystal-growing experiment	
						247 evaluate your ability to interpret rock formations	
						257 inverse square law	
						268 discovering the mathematical relationship between apparent brightness and distance	

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.2.10.C1	Inquiry and Design	Apply the elements of scientific inquiry to solve problems.	Generate questions about objects, organisms and/or events that can be answered through scientific investigations.	10	the research question and hypothesis	6	how do we ask questions and get answers from nature?
				429	why haven't we run out of water		
				434	what is in your tap water		
				437	what is acid rain		
				441	why are oceans salty		
				456	asking questions pertaining to specific heat and heat flow		
				472	why is Earth's atmosphere different from other planets		
				473	why do ears pop		
				492	why does Earth have seasons		
				501	how does rain form		
				509	how do animals survive in the desert		
				515	what is a carbon sink		
				534	why doesn't Earth get bigger and bigger		
				588	what causes eclipses		
				621	is Pluto a planet		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.2.10.C2	Inquiry and Design	Apply the elements of scientific inquiry to solve problems.	Evaluate the appropriateness of questions.	10	the research question and hypothesis	6	how do we ask questions and get answers from nature?
				429	why haven't we run out of water		
				434	what is in your tap water		
				437	what is acid rain		
				441	why are oceans salty		
				456	asking questions pertaining to specific heat and heat flow		
				472	why is Earth's atmosphere different from other planets		
				473	why do ears pop		
				492	why does Earth have seasons		
				501	how does rain form		
				509	how do animals survive in the desert		
				515	what is a carbon sink		
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3.2.10.C3	Inquiry and Design	Apply the elements of scientific inquiry to solve problems.	Design an investigation with adequate control and limited variables to investigate a question.	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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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.2.10.C4	Inquiry and Design	Apply the elements of scientific inquiry to solve problems.	Conduct a multiple step experiment.	12	writing lab procedures	9	conduct three experiments with appropriate equipment
						10	selecting ramp and photogates
						12	select equipment and set up experiment
						30	rigging block and tackle
						145	carry out procedure and select equipment
						151	select materials from list
						170	write a procedure
						196	writing a procedure for constructing a pointer for an aneroid barometer
						209	measuring the intensity of light using an electric meter and solar cell and light bulb
						214	develop a procedure to create an underwater spring
						252	identifying the parts of a refracting telescope and making observations of the moon's surface

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3.2.10.C5	Inquiry and Design	Apply the elements of scientific inquiry to solve problems.	Organize experimental information using a variety of analytic methods.	24	making a graph	9	construct a data table
				26	creating graphs	12	understand and use data table
				41	make a graph	13	graph distance vs. time
				42	interpreting distance/time graph	15	construct a quantitative graphical model
				459	heat equation	17	record results in data table
				645	inverse square law	18	organize different combinations of data
						24	use data table to record results
						25	create a mathematical model
						27	find math rule for lever equilibrium
						27	use data table to record results
						28	derive a math formula
						30	record ropes and pulley data in table
						36	organize data into a table
						37	organize data into a graph of speed vs. height
						51	graph voltage vs. current
						75	create data table for self-designed experiment
						121	graph mass vs. volume

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						147	organize observations into a category table
						151	design a data table
						171	use data table for observations
						181	organize water quality data into a table
						185	constructing a graph of drops of acid vs pH
						187	find equation for trend line
						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
						257	inverse square law
						268	discovering the mathematical relationship between apparent brightness and distance

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3.2.10.C6	Inquiry and Design	Apply the elements of scientific inquiry to solve problems.	Judge the significance of experimental information in answering the question.	19	which group did the best experiment?	18	evaluate graphs as to whether or not they show relationships between variables
						21	evaluate percent change for data collected
						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
						75	evaluate statistical significance
						171	evaluate method based on data
						200	evaluating your qualitative ozone strips

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3.2.10.C7	Inquiry and Design	Apply the elements of scientific inquiry to solve problems.	Suggest additional steps that might be done experimentally.	12	writing lab procedures	101 117 170 183 196 214	how could you extend the investigation to explore materials that give off light when heated? how could you find the volume of one drop of water? write a procedure specifying how the daphnia experiment could be improved writing a procedure for constructing a pointer for an aneroid barometer develop a procedure to create an underwater spring
3.2.10.D1	Inquiry and Design	Identify and apply the technological design process to solve problems.	Examine the problem, rank all necessary information and all questions that must be answered.	74	sample engineering problem	70 70 194	designing and testing different electric motors proposing and comparing different electric motor designs design and construct an aneroid barometer
3.2.10.D2	Inquiry and Design	Identify and apply the technological design process to solve problems.	Propose and analyze a solution			70	proposing and comparing different electric motor designs

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3.2.10.D3	Inquiry and Design	Identify and apply the technological design process to solve problems.	Implement the solution.			70 194	designing and testing different electric motors design and construct an aneroid barometer
3.2.10.D4	Inquiry and Design	Identify and apply the technological design process to solve problems.	Evaluate the solution, test, redesign and improve as necessary.			70 70 71 71 194	designing and testing different electric motors proposing and comparing different electric motor designs which motor gave the highest speed and why? did draining the batteries affect motor speed? design and construct an aneroid barometer
3.2.10.D5	Inquiry and Design	Identify and apply the technological design process to solve problems.	Communicate the process and evaluate and present the impacts of the solution.			71 145 179 181 183	testing a motor for performance present findings to the class create water quality report write paragraph to explain results write summary of findings

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3.4.10.A1	Physical Science, Chemistry and Physics	Explain concepts about the structure and properties of matter.	Know that atoms are composed of even smaller sub-atomic structures whose properties are measurable.	311	all matter is formed from atoms	132	atomic number determines what element that atom is
				311	all matter is formed from atoms	132	building atom models
				311	location/size/charge of subatomic particles	132	comparing atoms
				311	protons/neutrons/electrons	133	protons and neutrons
				315	atomic number discussed	133	location of electrons in atom
				315	atoms of same element have same atomic number	133	identify element symbol and name
				316	isotopes explained	133	identify mass number
				316	mass number discussed	133	identify atomic number
				318	proton/electron attraction	133	exploring isotopes
				322	atomic mass on the periodic table	136	atomic number
				322	atomic mass on the periodic table	136	mass number
				322	mass number on the periodic table	136	model stable and neutral atoms
				322	atomic number on the periodic table	136	understanding isotopes
				322	chemical symbols and element names	137	importance of atomic number
				322	chemical symbols and element names	137	build atomic models
				388	showing valence electrons in a diagram	140	review subatomic particles
				388	showing valence electrons in a diagram	140	find the number of electrons in outermost level

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3.4.10.A2	Physical Science, Chemistry and Physics	Explain concepts about the structure and properties of matter.	Explain the repeating pattern of chemical properties by using the repeating patterns of atomic structure within the periodic table.	320 321 321 329 330 332 332 335	groups of elements groups of elements and valence shells studying the periodic table periodic table columns and valence electrons bonding and periodic table position periodic table and electronegativities metals nonmetals and metalloids periodic table and oxidation numbers	133 136 141 142	using the periodic table building and studying the periodic table build model of Na and Cl atoms and explain why they bond to form a molecule arrangement of electrons and groups of elements
3.4.10.A3	Physical Science, Chemistry and Physics	Explain concepts about the structure and properties of matter.	Predict the behavior of gases through the use of Boyle's, Charles' or the ideal gas law, in everyday situations.	299 300 300	Charles' law what is pressure? Boyle's law	194 196	building a compression chamber to observe changes in atm pressure correcting your barometer's readings for the effects of temperature on a gas
3.4.10.A4	Physical Science, Chemistry and Physics	Explain concepts about the structure and properties of matter.	Describe phases of matter according to the Kinetic Molecular Theory.	284 284 285 405 498	states of matter and arrangement of molecules changes of state characteristics of matter related to its state molecular structure of ice phases changes in the atmosphere	118 118 118 119	observe melting process and study quantitatively investigate melting molecules in a liquid energy and phase changes

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3.4.10.A5	Physical Science, Chemistry and Physics	Explain concepts about the structure and properties of matter.	Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent).	278	compounds are composed of elements	136	ions
				324	which element is more likely to combine with other elements?	140	why do atoms form chemical bonds?
				324	use the periodic table to predict chemical formulas	141	when an atom ionizes
				330	ionic bonds	141	modeling a chemical bond
				331	covalent bonds	142	why do atoms combine in certain ratios?
				332	distinguishing between ionic and covalent bonds	143	classify ionic compounds
				335	chemical bonding and the periodic table	143	ionic compounds
				409	dissolving an ionic compound		
				410	solute dissolution depends on chemical bonds		
3.4.10.A6	Physical Science, Chemistry and Physics	Explain concepts about the structure and properties of matter.	Recognize formulas for simple inorganic compounds.	336	writing a chemical formula	143	name chemical compounds
				338	summary of chemical formula writing rules	143	predict chemical formulas
				339	naming compounds	145	determine empirical formula

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3.4.10.A7	Physical Science, Chemistry and Physics	Explain concepts about the structure and properties of matter.	Describe various types of chemical reactions by applying the laws of conservation of mass and energy.	354	chemical reactions and digestion	148	reactants and products
				357	chemical reactions involve rearrangement of atoms	148	chemical equations
				359	balancing chemical equations	149	balance these equations
				361	chemical reactions in living systems	149	practice balancing equations
				363	history of law of conservation of mass	150	investigate conservation of mass in effervescent tablet reaction
				364	formation of petroleum is a very slow chemical reaction	152	write the balanced equation
				371	which of the equations is balanced?	152	predict how much product formed given the reactants
				375	synthesis or addition reactions	156	investigate double displacement reactions
				376	decomposition reactions	156	predict products in a double displacement reaction
				377	double displacement reactions	157	predict the products of double displacement reactions
				377	single displacement reactions	158	investigate energy changes in chemical reactions
				378	consumer chemistry	158	measure energy changes in 3 different reactions
				378	combustion reactions		
				381	MRE ration heater reaction	162	investigating combustion reactions
				381	exothermic reactions and MREs		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
				382	endothermic reactions and cold packs		
				395	chemistry of the atmosphere		
				395	chemistry of the atmosphere		
				397	carbon reactions		
				419	dissociation of water		
				438	chemical reactions and the formation of acid rain		
3.4.10.A8	Physical Science, Chemistry and Physics	Explain concepts about the structure and properties of matter.	Apply knowledge of mixtures to appropriate separation techniques.	278	mixtures can be separated by physical means	114	separating a homogeneous mixture
				279	summary of matter classification	114	investigate a homogeneous mixture
				288	create a poster of matter classification	169	investigate solutions and colloids and suspensions
3.4.10.A9	Physical Science, Chemistry and Physics	Explain concepts about the structure and properties of matter.	Understand that carbon can form several types of compounds.	364	carbon chains	162	carbon reactions and the environment
				394	photosynthesis and carbon reactions	162	structure of fossil fuels
				395	fossil fuels and carbon reactions	162	importance of fossil fuels
3.4.10.B1	Physical Science, Chemistry and Physics	Analyze energy sources and transfers of heat.	Determine the efficiency of chemical systems by applying mathematical formulas.	336	writing chemical formulas	155	calculating product yield
				368	predicting amount of product		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.B2	Physical Science, Chemistry and Physics	Analyze energy sources and transfers of heat.	Use knowledge of chemical reactions to generate an electrical current.	357 361	combustion reaction heartburn reaction		
3.4.10.B3	Physical Science, Chemistry and Physics	Analyze energy sources and transfers of heat.	Evaluate energy changes in chemical reactions.	381 382	exothermic reactions and MREs endothermic reactions and cold packs	158	investigate energy changes in chemical reactions
3.4.10.B4	Physical Science, Chemistry and Physics	Analyze energy sources and transfers of heat.	Use knowledge of conservation of energy and momentum to explain common phenomena (e.g., refrigeration system, rocket propulsion).	45 59 60 60 64	Newton's third law summarized Newton's third law in detail how to calculate momentum law of conservation of momentum calculate momentum	22 23	car and ramp and Newton's 3rd law using 3rd law to explain common phenomena

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.B5	Physical Science, Chemistry and Physics	Analyze energy sources and transfers of heat.	Explain resistance, current and electro-motive force (Ohm's Law).	101	concept of electric current	44	investigate concept of voltage
				114	voltage and potential energy	46	investigate concept of electric current
				115	how to measure voltage	48	measuring resistance
				117	electrical current explained	50	Ohm's law
				119	how to measure current	56	build a series circuit
				123	understand the concept of electrical resistance	56	build a parallel circuit
				131	Ohm's law explained	57	compare brightness of bulbs in series vs. parallel
				132	using Ohm's law to analyze circuits	58	build a series circuit and find total resistance
				136	potentiometer explained	60	parallel circuit and Ohm's law
				145	parallel circuit defined	61	compare current and voltage and resistance in each type of circuit
				145	holiday lights as series or parallel		
				145	series circuit defined		
				145	single path vs. branching paths		
				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		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.C1	Physical Science, Chemistry and Physics	Distinguish among the principles of force and motion.	Identify the relationship of electricity and magnetism as two aspects of a single electromagnetic force.	105	charge is a fundamental property of matter	42	investigate electric charge
				106	static charge discussed	62	describing forces that magnets exert on each other
				107	explanation of coulomb		
				108	how an electroscope works	64	testing materials to see if they are affected by magnets
				108	electroscopes		
				159	magnetism explained	66	compare electromagnets and permanent magnets
				163	understanding magnetic fields	66	build an electromagnet
				164	what is an electromagnet?	67	find out what happens to strength of electromagnet when current is increased
				166	building an electromagnet		
				166	increased current vs. strength of magnetic field	68	investigate how an electric motor works
				168	how electric motors work	73	exploring electric generators
				170	dissecting an electric motor	73	use magnetic induction to create an electric field
				171	electromagnetic induction explained		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.C2	Physical Science, Chemistry and Physics	Distinguish among the principles of force and motion.	Identify elements of simple machines in compound machines.	67	how simple machines manipulate forces	25	discover mechanical advantage of ropes and pulleys
				69	how to calculate mechanical advantage	27	changing force and distance on a lever
				70	mechanical advantage of block and tackle	27	set up a lever that has mechanical advantage
				71	pliers as an example of a lever	30	exploring force and distance with ropes and pulleys
				71	parts of a lever		
				71	the human body and simple machines		
				71	how a lever works		
				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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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.C3	Physical Science, Chemistry and Physics	Distinguish among the principles of force and motion.	Explain fluid power systems through the design and construction of appropriate models.			124 build a density column 126 investigating buoyancy with clay boats 128 use CPO viscometer to study viscosity 212 investigate density changes in the oceans as the cause of ocean layering	

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.C4	Physical Science, Chemistry and Physics	Distinguish among the principles of force and motion.	Describe sound effects (e.g., Doppler effect, amplitude, frequency, reflection, refraction, absorption, sonar, seismic).	197	transverse and longitudinal waves	82	study wave pulses on elastic cord
				198	frequency and wavelength and amplitude	83	measure speed of a wave pulse
				201	waves and reflection	84	make different types of waves in a ripple tank
				201	reflection in water waves and light waves	85	observing reflection in water waves
				201	waves and refraction	86	investigate frequency and wavelength
				201	waves and absorption	87	investigating resonance
				202	refraction and eyeglasses	88	natural frequency and resonance of standing waves on a string
				204	resonance explained	90	investigate human perception of sound
				205	standing waves on a string	90	investigate human perception of sound
				206	constructive and destructive interference	90	what is sound and how do we hear it?
				210	natural frequency of a building and earthquakes	94	does sound behave like other waves?
				210	can wave interference sink a ship?	95	interference and sound waves
				213	how the ear works	95	investigate interference with sound waves
				215	properties of sound waves	96	investigating sound resonance
				217	loudness and decibels		
				219	frequency of sound and pitch		
				220	white noise		
				220	sonograms		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
				220	voice recognition programs	98	investigate sound and music
				222	effect of medium on speed of sound wave	101	examine light through diffraction grating
				222	effect of temperature on speed of sound wave	108	explore refraction with a prism
				223	interference of sound waves		
				225	consonance and dissonance and beats		
				226	musical instruments		
				242	properties of light waves		
				261	refraction and lenses		
				538	body waves		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.C5	Physical Science, Chemistry and Physics	Distinguish among the principles of force and motion.	Describe light effects (e.g., Doppler effect, dispersion, absorption, emission spectra, polarization, interference).	196	waves are all around us	100	study what makes light
				234	what makes light?	101	observing white light through diffraction grating
				237	radio and television signals	102	polarization of a spring wave
				237	microwave ovens	102	polarization of water waves
				237	light waves and the electromagnetic spectrum	103	polarization of light
				237	visible light and the electromagnetic spectrum	104	investigate RGB model of color
				240	polarization of light	105	explore relationship between color and wavelength
				242	color and frequency of light waves	106	tracing incident and reflected rays
				243	RGB model of color	106	investigate reflection of light
				245	we see color in terms of reflected light	107	investigate how light interacts with mirrors
				250	identify uses of electromagnetic waves	107	plot reflected rays from a mirror
				258	forming images with lenses	108	investigate how light interacts with a prism
				258	refraction in optical systems	108	explore refraction with lenses
				260	reflection and mirrors	108	tracing incident and refracted rays
				263	index of refraction	110	finding focal point and focal length of a lens
				263	index of refraction		
				264	human eye as an optical instrument		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
				272	identify uses of electromagnetic waves	111	plotting images formed when light is refracted by a lens
				273	find the angle of reflection		
				479	ultraviolet and infrared light	134	investigating visible light with a spectrometer
				480	absorption and emission	253	using a retractive telescope
						265	an element's spectral lines correspond to specific wavelengths of light

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.C6	Physical Science, Chemistry and Physics	Distinguish among the principles of force and motion.	Describe and measure the motion of sound, light and other objects.	14	how to calculate speed	8	calculating speed
				15	compare and contrast speed and velocity	9	collect data and calculate speed of car
				20	find speed of bumblebee	10	calculate speed of the car
				20	calculate speed of car	12	find speed of car at different positions
				24	accurate speed measurements	12	calculate speed of moving car
				29	position vs. time graph discussion	12	model the car's motion graphically
				30	position vs. time graphs	13	make a position vs. time graph
				32	average speed vs. instantaneous	14	acceleration is the rate at which speed changes
				32	average speed discussed	14	calculate speed of car at two places on the ramp
				33	understanding acceleration	15	make a speed vs. time graph
				36	examples of acceleration	15	make a speed vs. time graph
				37	speed vs. time graphs	15	changes in motion can be represented graphically
				37	speed vs. time graph discussion	17	calculate speed of car
				42	calculate speed from distance/time graph	20	investigate effect of gravity on motion
				52	the effect of gravity	21	effect of friction on the car
				56	friction explained	36	find speed of marble
				64	research effect of friction on human joints	83	find speed of a wave
				179	what is a cycle?		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
				182	concept of period explained	86	adjust frequency of a standing wave
				182	concept of frequency explained		
				192	analyze systems to find cycle/period/frequency		
				195	waves transmit energy		
				221	importance of wavelength of sound waves		
				480	energy and radiation relationships		
				626	the sun's energy reaches Earth in the form of electromagnetic waves		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.C7	Physical Science, Chemistry and Physics	Distinguish among the principles of force and motion.	Know Newton's laws of motion (including inertia, action, and reaction) and gravity and apply them to solve problems related to forces and mass.	45	Newton's first law summarized	14	exploring acceleration on a ramp
				45	Newton's second law summarized	16	2nd law
				45	Newton's third 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
				48	Newton's laws explained and applied	19	find correct relationship between force mass and acceleration
				49	Newton's second law in detail	20	investigate effect of gravity on motion
				49	force is related to acceleration	20	force and motion with car and ramp
				50	Newton's second law applied	21	effect of friction on the car
				51	balanced and unbalanced forces	22	car and ramp and Newton's 3rd law
				52	the effect of gravity	23	using 3rd law to explain common phenomena
				56	friction explained		
				59	Newton's third law in detail		
				64	research effect of friction on human joints		
				64	solving problems using $f=ma$		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
				599	Newton's first law of motion and the space shuttle		
3.4.10.C8	Physical Science, Chemistry and Physics	Distinguish among the principles of force and motion.	Determine the efficiency of mechanical systems by applying mathematical formulas.	85	efficiency explained	191	find efficiency of water heater
				85	efficiency and bicycles		
				97	find the efficiency of a machine		
				97	calculate work output from efficiency data		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.D1	Physical Science, Chemistry and Physics	Explain essential ideas about the composition and structure of the universe.	Compare the basic structures of the universe (e.g., galaxy types, nova, black holes, neutron stars).	591	characteristics of the universe		featured in Earth and Space Science module
				612	orbits of planets around the sun	256	simulate an object in orbit and investigate how orbital period varies within distance
				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
				619	asteroids and comets	260	determining scale sizes of the planets
				620	meteors and meteorites and the Kuiper Belt		
				622	descriptions of the sun and comparisons to other stars		
				633	what is a star?		
				635	size of the sun compare to other stars		
				637	H-R diagrams comparing temperature and brightness of stars		
				642	what is a galaxy?		
				643	the structure of the Milky Way Galaxy		
				652	research and describe astronomical objects		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.D2	Physical Science, Chemistry and Physics	Explain essential ideas about the composition and structure of the universe.	Describe the structure and life cycle of star, using the Hertzsprung-Russell diagram.	638	the life cycle of stars		featured in Earth and Space Science module
				639	description and illustration of 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
				640	elements formed by nuclear fusion in stars		
				640	death of massive stars results in supernovas and neutron stars and black holes		
3.4.10.D3	Physical Science, Chemistry and Physics	Explain essential ideas about the composition and structure of the universe.	Describe the nuclear processes involved in energy production in a star.	638	the life cycle of stars		featured in Earth and Space Science module
				639	death of small to medium stars results in white dwarfs and planetary nebula and black dwarfs	255	observe and describe the appearance of the moon and Jupiter and its moons
				639	description and illustration of the life cycle of stars	264	using spectroscopy to analyze the light emitted by stars and identify most common elements
				640	birth of elements		
				640	death of massive stars		
				640	death of massive stars results in supernovas and neutron stars and black holes		
				640	elements formed by nuclear fusion in stars		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.D4	Physical Science, Chemistry and Physics	Explain essential ideas about the composition and structure of the universe.	Explain the "red-shift" and Hubble's use of it to determine stellar distance and movement.	648	evidence for the Big Bang theory		featured in Earth and Space Science module
				649	evidence for the Big Bang theory	268	calculating the distance to stars and galaxies using apparent brightness and absolute brightness
3.4.10.D5	Physical Science, Chemistry and Physics	Explain essential ideas about the composition and structure of the universe.	Compare absolute versus apparent star magnitude and their relation to stellar distance.	592	calculating and using light years		featured in Earth and Space Science module
				593	light years and time	264	using spectroscopy to analyze the light emitted by stars and identify most common elements
				639	death of small to medium stars results in white dwarfs and planetary nebula and black dwarfs		
				640	death of massive stars results in supernovas and neutron stars and black holes	268	calculating the distance to stars and galaxies using apparent brightness and absolute brightness

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.4.10.D6	Physical Science, Chemistry and Physics	Explain essential ideas about the composition and structure of the universe.	Explain the impact of the Copernican and Newtonian thinking on man's view of the universe.	34 45 54 105 107 611 612 621 647	Aristotle vs. Newton Newton's Laws of Motion Newton and the force of gravity Benjamin Franklin Charles-Augustin Coulomb historical theories of the origin of the moon historical theories about the solar system historical theories of which objects were planets the Big Bang theory of the origin of the universe		featured in Earth and Space Science module
3.4.10.D7	Physical Science, Chemistry and Physics	Explain essential ideas about the composition and structure of the universe.	Identify and analyze the findings of several space instruments in regard to the extent and composition of the solar system and universe.	594 595 596 597 598 634	history of the telescope types and uses of telescopes types and uses of telescopes satellites as tools of astronomy spacecraft as tools of astronomy the use of spectroscopy to analyze stars	264 268	featured in Earth and Space Science module understand why spectroscopy is an important tool of astronomers measuring apparent brightness to calculate the distance to stars and galaxies

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.5.10.A1	Earth Sciences	Relate earth features and processes that change the earth.	Illustrate and explain plate tectonics as the mechanism of continental movement and sea floor changes.	528	definition of plate tectonics	228	listing which kind of plate boundary is associated with each geologic feature
				530	sea-floor spreading and mid-ocean ridges		
				531	magnetic patterns on the sea floor		
				532	theory of plate tectonics		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.5.10.A2	Earth Sciences	Relate earth features and processes that change the earth.	Compare examples of change to the earth's surface over time as they related to continental movement and ocean basin formation.	528	predicting what Earth might look like in 50 million years	229	identifying tectonic plates and plate boundaries
				533	describing plate boundaries	230	predicting plate movement over 50 million years and the resultant land features
				534	land features resulting from divergent plate boundaries	240	estimating the effects of meteor impacts on Earth
				534	divergent plate boundaries	241	identifying which geologic features on Earth were caused by meteors
				535	convergent plate boundaries		
				535	resulting land features from subduction		
				536	transform plate boundaries		
				536	land features resulting from transform plate boundaries		
				547	predict separation of North America and Europe in 75 million years		
				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		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
				563	constructive process of mountain building		
				563	mountain-building		
				564	the destructive process of erosion		
				564	changes in land features due to erosion		
				565	wind erosion		
				566	effect of glaciers on land		
3.5.10.A3	Earth Sciences	Relate earth features and processes that change the earth.	Interpret topographic maps to identify and describe significant geologic history/structures in Pennsylvania		featured in ancillary component		featured in ancillary component
						237	plot locations of volcanoes using latitude and longitude

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.5.10.A4	Earth Sciences	Relate earth features and processes that change the earth.	Evaluate and interpret geologic history using geologic maps.	510	using maps to identify mountain ranges	225	determining the relative ages of rock formations
				522	relative dating	226	sequencing events in a geologic cross-section
				523	interpreting rock formations	228	reading a bathymetric map
				540	where earthquakes occur	229	using a geologic hazard map of frequent earthquakes
				541	earthquake hazard map	229	using a globe to identify mountain ranges
				553	using a map to identify volcanoes	229	using a globe to identify mountain ranges
				555	formation of shield volcanoes due to hot spots	237	finding a pattern of volcanoes related to the locations of plate boundaries
				556	formation of stratovolcanoes due to subduction		
				567	geologic hazard maps		
				569	studying moon rocks on Earth		
				580	using a geologic hazard map		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.5.10.A5	Earth Sciences	Relate earth features and processes that change the earth.	Explain several methods of dating earth materials and structures.	522 523 523 524 566 569	relative dating faunal succession interpreting rock formations table and description of the geologic time scale ice ages studying moon rocks on Earth	225 226	determining the relative ages of rock formations sequencing events in a geologic cross-section
3.5.10.A6	Earth Sciences	Relate earth features and processes that change the earth.	Correlate rock units with general geologic time periods in the history of the earth.	522 523 523 524 566 569	relative dating interpreting rock formations faunal succession table and description of the geologic time scale ice ages studying moon rocks on Earth	225 226	determining the relative ages of rock formations sequencing events in a geologic cross-section
3.5.10.A7	Earth Sciences	Relate earth features and processes that change the earth.	Describe and identify major types of rocks and minerals.	570 571 572	properties of minerals common minerals Mohs hardness scale		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.5.10.B1	Earth Sciences	Explain sources and uses of earth resources.	Compare the locations of strategic minerals and earth resources in the world with their geologic time history using maps and global information systems.	522	relative dating	225	determining the relative ages of rock formations
				523	interpreting rock formations	226	sequencing events in a geologic cross-section
				533	activity of Earth's crust at plate boundaries	237	examining the magma chemistry of volcanoes and how it relates to a volcano's location
				534	balance of creating and consuming Earth's crust		
				542	using seismic waves for oil and gas exploration	242	understanding how igneous rocks are formed and growing crystals to investigate their formation
				554	properties of volcanically formed rock		
				559	types of volcanic rock	244	understanding how sedimentary rocks are formed and creating sedimentary deposits to investigate them
				560	mineral deposits and diamonds		
				561	describing volcanic rock		
				562	constructive and destructive processes	246	understanding and investigating how metamorphic rocks are formed
				569	studying moon rocks on Earth		
				573	formation of igneous and sedimentary and metamorphic rocks	247	interpreting how different rock formations were formed
				575	identifying igneous and sedimentary and metamorphic rocks		
				576	the rock cycle		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.5.10.B2	Earth Sciences	Explain sources and uses of earth resources.	Demonstrate the effects of sedimentation and erosion before and after a conservation plan is implemented.	528	predicting what Earth might look like in 50 million years	230	predicting plate movement over 50 million years and the resultant land features
				534	land features resulting from divergent plate boundaries		
				535	resulting land features from subduction		
				536	land features resulting from transform plate boundaries		
				547	predict separation of North America and Europe in 75 million years		
				548	predict effects of divergent plate boundaries on Great Rift Valley		
				562	constructive and destructive processes		
				563	mountain-building		
				564	changes in land features due to erosion		
				565	formation of soil		
				566	effect of glaciers on land		
				576	the rock cycle		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.5.10.B3	Earth Sciences	Explain sources and uses of earth resources.	Evaluate the impact of geologic activities/hazards (e.g., earthquakes, sinkholes, landslides).	537	earthquakes and plate tectonics	228	reading a bathymetric map
				537	causes and descriptions of earthquakes	229	using a geologic hazard map of frequent earthquakes
				539	earthquakes rating scales		
				540	where earthquakes occur	236	understanding the Volcanic Explosivity Index
				541	earthquake hazard map	237	finding a pattern of volcanoes related to the locations of plate boundaries
				551	structure of a volcano		
				552	formation of magma in Earth's mantle		
				552	geologic basis for volcanic eruptions	240	estimating the effects of meteor impacts on Earth
				553	where volcanic activity occurs	241	identifying which geologic features on Earth were caused by meteors
				554	types and shapes of volcanoes		
				554	figure showing structure of different types of volcanoes		
				555	formation of shield volcanoes due to hot spots		
				555	formation of Hawaiian Islands due to volcanic activity		
				555	shield volcanoes		
				555	geologic basis for shield volcanoes		
				556	stratovolcanoes		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
				556	geologic basis for stratovolcanoes		
				556	formation of stratovolcanoes due to subduction		
				557	geologic bases for cinder cone volcanoes		
				558	volcanoes shape the Earth		
				563	constructive process of mountain building		
				564	the destructive process of erosion		
				565	wind erosion		
				567	geologic hazard maps		
				580	using a geologic hazard map		
3.5.10.B4	Earth Sciences	Explain sources and uses of earth resources.	Evaluate land use (e.g., agricultural, recreational, residential, commercial) in Pennsylvania based upon soil characteristics.		featured in ancillary component		featured in ancillary component
				437	effects of acid rain on the soil	229	using a globe to identify mountain ranges
				510	using maps to identify mountain ranges	237	plot locations of volcanoes using latitude and longitude
				553	using a map to identify volcanoes		

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3.5.10.C1	Earth Sciences	Interpret meteorological data.	Analyze information from meteorological instruments and online sources to predict weather patterns.	451	thermometers	186	accurately measuring temperature using thermometers
				452	thermometers		
				474	measuring atmospheric pressure with barometers	194	construct and use an aneroid barometer
				485	computer modeling to predict greenhouse effects	207	research how large bodies of water affect climate
				495	global wind patterns	215	understanding the Atlantic gyre
				496	descriptions of ocean currents and their effects on climate	217	finding relative humidity
				497	sling psychrometer	218	using Doppler radar images to detect and track storms
				498	phase changes in the atmosphere and dewpoint		
				501	forms of precipitation		
				502	cold fronts		
				502	effects of moving air masses		
				503	jet streams		
				503	warm fronts		

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3.5.10.C2	Earth Sciences	Interpret meteorological data.	Describe weather and climate patterns on global levels.	481	greenhouse effect and greenhouse gasses	185	effect of ocean on carbon dioxide levels in the atmosphere
				491	Earth's temperature varies with latitude	202	investigate the temperature effects of greenhouse gasses
				492	Earth's tilt causes seasons	207	research how large bodies of water affect climate
				493	convection currents in the atmosphere	207	research how large bodies of water affect climate
				495	global wind patterns	209	investigating factors which cause the seasons
				496	descriptions of ocean currents and their effects on climate	213	exploring how temperature-dependent layering creates currents
				496	effects of the Gulf Stream on climate of Great Britain	215	understanding the Atlantic gyre
				497	factors which influence the weather	219	use radar to detect a tornado
				497	water in the atmosphere affects weather patterns	220	using radar to track a hurricane
				499	cloud formation	223	research a particular biome
				502	cold fronts		
				502	effects of moving air masses		
				503	jet streams		
				503	warm fronts		
				505	description of thunderstorms		
				506	description of hurricanes		
				507	description of tornadoes		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
				508	causes and effects of the El Nino Southern Oscillation		
				509	descriptions and distribution of desert biomes		
				510	effect of cold ocean currents on formation of fog deserts		
				510	different types of deserts and how they are formed		
				511	effect of warm ocean currents on formation of tropical rainforest		
				511	descriptions and distribution of tropical rainforest biomes		
				511	how tropical rainforests are formed		
				513	effect of large bodies of water on climate		
				515	alpine tundra occurs at high altitudes		
				518	create a model to explain why Earth has seasons		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.5.10.C3	Earth Sciences	Interpret meteorological data.	Evaluate specific adaptations plants and animals have made that enable them to survive in different climates.	509	descriptions and distribution of desert biomes	223	research a particular biome
				510	different types of deserts and how they are formed		
				511	how tropical rainforests are formed		
				511	descriptions and distribution of tropical rainforest biomes		
3.5.10.D1	Earth Sciences	Assess the value of water as a resource.	Compare specific sources of potable water (e.g., wells, public systems, rivers) used by people in Pennsylvania.		featured in ancillary component		featured in ancillary component
3.5.10.D2	Earth Sciences	Assess the value of water as a resource.	Identify the components of a municipal/agricultural water supply system and a wastewater treatment system.		featured in ancillary component		featured in ancillary component
3.5.10.D3	Earth Sciences	Assess the value of water as a resource.	Relate aquatic life to water conditions (e.g., turbidity, temperature, salinity, dissolved oxygen, nitrogen levels, pressure).	437	effects of acid rain on natural environments	178	actions to take to improve water quality
				440	supply of water to oceans	212	investigate how the ocean's salinity affects its density
				441	sources of salts in the ocean		
				442	composition of seawater		
				471	nitrogen cycle		

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Standard #:	Category	Standard Statement	Standard Descriptors	student text pg	detail	investigation pg	detail
3.5.10.D4	Earth Sciences	Assess the value of water as a resource.	Compare commercially important aquatic species in or near Pennsylvania.		featured in ancillary component		featured in ancillary component
3.5.10.D5	Earth Sciences	Assess the value of water as a resource.	Identify economic resources found in marine areas.	440	supply of water to oceans		
3.5.10.D6	Earth Sciences	Assess the value of water as a resource.	Assess the natural and man-made factors that affect the availability of clean water (e.g., rock and mineral deposits, man-made pollution).	411	effects of PCB's in Great Lakes	178	actions to take to improve water quality
				433	water quality standards	178	predict the quality of surface water to be tested and justify your answer
				433	The Clean Water Act		
				434	importance of water analysis		
				435	water quality testing	179	address what you can do to maintain or improve the water quality at the test site
				436	water quality testing		
				437	effects of acid rain on natural environments	182	the effects of acid rain on organisms in aquatic environments
				437	acid rain		
				440	oceans in the water cycle		
				443	impact of increased CO2 on oceans		
				444	pollution and the ocean food chain		
				445	pollution and the ocean food chain		
				471	nitrogen cycle		
				559	volcanoes and water vapor		