

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
ES01.01 Earth and Space Science	Energy in the Earth System	Earth systems have internal and external sources of energy, both of which create heat. The sun is the major external source of energy. Two primary sources of internal energy are the decay of radioactive isotopes and the gravitational energy...	91 480 481 485 623 626	following an energy transformation distribution of incoming solar radiation Earth's "energy budget" Earth's internal energy energy from the sun harnessing the sun's energy	39	make an energy flow chart

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
ES01.02 Earth and Space Science	Energy in the Earth System	The outward transfer of the earth's internal heat drives convection circulation in the mantle that propels the plates comprising earth's surface across the face of the globe.	462	densely packed solids are good conductors of heat	192	investigate convection in liquids
			462	heat transfer through air	192	investigate heat transfer through a liquid by natural convection
			463	convection currents and weather	193	investigate heat transfer through a liquid by forced convection
			463	warming hands over candle	228	listing which kind of plate boundary is associated with each geologic feature
			464	convection currents in water	229	identifying tectonic plates and plate boundaries
			465	solid road surface emits radiation		
			465	transfer of heat by radiation		
			482	global warming and heat transfer by radiation		
			493	apply knowledge of heat transfer to different situations		
			525	convection inside Earth		
			528	definition of plate tectonics		
			530	sea-floor spreading and mid-ocean ridges		
			531	magnetic patterns on the sea floor		
			532	theory of plate tectonics		
			533	describing plate boundaries		

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
			534	divergent plate boundaries		
			535	convergent plate boundaries		
			536	transform plate boundaries		
ES01.03 Earth and Space Science	Energy in the Earth System	Heating of earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents.	493	convection currents in the atmosphere	213	exploring how temperature-dependent layering creates currents

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
ES01.04 Earth and Space Science	Energy in the Earth System	Global climate is determined by energy transfer from the sun at and near the earth's surface. This energy transfer is influenced by dynamic processes such as cloud cover and the earth's rotation, and static conditions...	480	distribution of incoming solar radiation	207	research how large bodies of water affect climate
			480	transfer of energy in and out of Earth's atmosphere	223	research a particular biome
			481	Earth's "energy budget"		
			491	Earth's temperature varies with latitude		
			494	the Coriolis effect		
			495	global wind patterns		
			496	effects of the Gulf Stream on climate of Great Britain		
			502	effects of moving air masses		
			502	cold fronts		
			503	jet streams		
			503	warm fronts		
			504	rotation of air masses due to Coriolis effect		
			510	different types of deserts and how they are formed		
			510	effect of cold ocean currents on formation of fog desserts		
			511	how tropical rainforests are formed		
			511	effect of warm ocean currents on formation of tropical rainforest		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
			513	effect of large bodies of water on climate		
			515	alpine tundra occurs at high altitudes		
ES02.01 Earth and Space Science	Geochemical Cycles	The earth is a system containing essentially a fixed amount of each stable chemical atom or element. Each element can exist in several different chemical reservoirs. Each element on earth moves among reservoirs in the solid earth, oceans, atmosphere...	440 559	oceans in the water cycle volcanoes and water vapor		

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
ES02.02 Earth and Space Science	Geochemical Cycles	Movement of matter between reservoirs is driven by the earth's internal and external sources of energy. These movements are often accompanied by a change in the physical and chemical properties of the matter. Carbon, for example...	437 471 564	effects of acid rain on natural environments nitrogen cycle landforms shaped by water	178	actions to take to improve water quality
ES03.01 Earth and Space Science	The Origin and Evolution of the Earth System	The sun, the earth, and the rest of the solar system formed from a nebular cloud of dust and gas 4.6 billion years ago. The early earth was very different from the planet we live on today.	611 612 621 647 648 649	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 evidence for the Big Bang theory evidence for the Big Bang theory		

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
ES03.02 Earth and Space Science	The Origin and Evolution of the Earth System	Geologic time can estimated by observing rock sequences and using fossils to correlate the sequences at various locations. Current methods include using the known decay rates of radioactive isotopes present in rocks...	522 523 523 569	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

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
ES03.03 Earth and Space Science	The Origin and Evolution of the Earth System	Interactions among the solid earth, the oceans, the atmosphere, and organisms have resulted in the ongoing evolution of the earth system. We can observe some changes such as earthquakes and volcanic eruptions on a human time scale...	414	effect of electrical generating facilities on dissolved oxygen in water	178	actions to take to improve water quality
			437	effects of acid rain on natural environments	178	predict the quality of surface water to be tested and justify your answer
			439	illustration of acid rain formation	230	predicting plate movement over 50 million years and the resultant land features
			443	impact of increased CO2 in oceans	240	estimating the effects of meteor impacts on Earth
			471	nitrogen cycle	241	identifying which geologic features on Earth were caused by meteors
			479	effects of CFC's on the ozone layer		
			481	global warming		
			482	changes to the oceans due to increasing global temperatures		
			482	effects of burning fossil fuels		
			515	permafrost		
			524	table and description of the geologic time scale		
			528	definition of plate tectonics		
			528	predicting what Earth might look like in 50 million years		
			532	theory of plate tectonics		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
			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		
			555	formation of Hawaiian Islands due to volcanic activity		
			558	volcanoes shape the Earth		
			562	constructive and destructive processes		
			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		

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
			565	formation of soil		
			566	ice ages		
			566	effect of glaciers on land		
			568	environmental impact of urban sprawl		
			568	how urban sprawl changes local climate		
			576	the rock cycle		
ES03.04 Earth and Space Science	The Origin and Evolution of the Earth System	Evidence for one- celled forms of life--the bacteria-- extends back more than 3.5 billion years. The evolution of life caused dramatic changes in the composition of the earth's atmosphere, which did not originally contain oxygen.	472	comparison of Earth's atmosphere to other planets		
			524	table and description of the geologic time scale		
			566	ice ages		
			615	what makes Earth capable of supporting life		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
ES04.01 Earth and Space Science	The Origin and Evolution of the Universe	The origin of the universe remains one of the greatest questions in science. The "big bang" theory places the origin between 10 and 20 billion years ago, when the universe began in a hot dense state: according to this theory...	611 612 621 647 648 649	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 evidence for the Big Bang theory evidence for the Big Bang theory		
ES04.02 Earth and Space Science	The Origin and Evolution of the Universe	Early in the history of the universe, matter, primarily the light atoms hydrogen and helium, clumped together by gravitational attraction to form countless trillions of stars. Billions of galaxies, each of which is a gravitational bound cluster...	638 639 640 641	the life cycle of stars description and illustration of the life cycle of stars elements formed by nuclear fusion in stars how the solar system was formed	255	observe and describe the appearance of the moon and Jupiter and its moons

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
ES04.03 Earth and Space Science	The Origin and Evolution of the Universe	Stars produce energy from nuclear reactions, primarily the fusion of hydrogen to form helium. These and other processes in stars have led to the formation of all the other elements.	640 640	birth of elements death of massive stars	264 267	light emission and chemical composition spectral lines and elements

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
INQ01.1 Inquiry	Abilities Necessary to do Scientific Inquiry	Identify questions and concepts that guide scientific investigations	7	experimentation begins with a question	6	how do we ask questions and get answers from nature?
			10	the research question and hypothesis	7	design your own experiment
			19	design your own experiment	7	perform your own experiment
			42	devise an experiment	9	design three experiments using car and ramp
			429	why haven't we run out of water	10	conduct car/ramp experiment
			434	what is in your tap water	16	decide how to vary the force on the car for this experiment
			437	what is acid rain	16	investigate Newton's 2nd law
			441	why are oceans salty	26	what variables can be changed?
			451	what is temperature	34	investigate motion on a rollercoaster
			456	asking questions pertaining to specific heat and heat flow	75	perform self-designed experiment
			472	why is Earth's atmosphere different from other planets	75	design pendulum experiment
			473	why do ears pop	151	design experiment to find out if mass is conserved
			492	why does Earth have seasons	170	what three factors influence dissolving rate?
			501	how does rain form	170	which method will give fastest dissolving rate?
			509	how do animals survive in the desert		
			515	what is a carbon sink		
			534	why doesn't Earth get bigger and bigger		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
			588	what causes eclipses	182	simulating the effect of acid rain on daphnia
			621	is Pluto a planet	188	conducting investigation of efficiency of immersion heater
					193	conducting experiments on heat transfer
					205	investigating how specific heat of water regulates Earth's temperature
					233	identifying how the earthquake model represents an earthquake

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
INQ01.2 Inquiry	Abilities Necessary to do Scientific Inquiry	Design and conduct scientific investigations	7	experimentation begins with a question	6	predict which car will move fastest
			9	steps in the scientific method	7	compare results with hypothesis
			10	forming a hypothesis	7	design your own experiment
			11	control and experimental variables	7	doing a controlled experiment
			19	design your own experiment	7	perform your own experiment
			19	which group did the best experiment?	7	test the effect of one other variable
			19	design your own experiment	9	conduct three experiments with appropriate equipment
			20	finding variability in data	9	design three experiments and choose equipment
			26	independent and dependent variables	9	design three experiments and choose technology
			28	identifying cause and effect relationships	9	design three experiments using car and ramp
			41	identify cause and effect	9	devise a hypothesis
			42	devise an experiment	10	conduct car/ramp experiment
			79	look at force data and decide the usefulness of a machine	10	selecting ramp and photogates
			288	find the thickness of a single card	12	select equipment and set up experiment
			438	what causes acid rain		
			452	safety caution on heating jar		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
			456	determining effect of changing mass on temperature changes	14	record three different time intervals
			460	thermal equilibrium	16	decide how to vary the force on the car for this experiment
			497	factors that shape the weather	16	investigate Newton's 2nd law
			608	relationship between orbital speed and distance between two objects	18	use data to describe relationship between force and motion
			627	research space solar power	18	evaluate graphs as to whether or not they show relationships between variables
					19	use data to infer correct relationship between variables
					20	safety tip for car/ramp setup
					21	evaluate percent change for data collected
					21	determine effect of increasing mass
					24	ropes and pulley safety
					25	collect force data
					26	what variables can be changed?
					26	safety tip for hanging weights from lever

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					27	write down the number of weights you use
					27	think about the variables
					27	recognize variables
					30	interpret block and tackle data
					30	rigging block and tackle
					34	investigate motion on a rollercoaster
					34	where does the marble move the fastest?
					40	electrical safety
					40	choose circuit parts to light a bulb
					43	how did A and B tapes acquire different charge?
					44	short circuit safety warning
					56	short circuit safety warning
					58	short circuit safety warning
					75	evaluate statistical significance
					75	perform self-designed experiment
					75	investigate variables that affect the period of a pendulum

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					75	plan three experiments to determine which variable affects the period of a pendulum
					75	design pendulum experiment
					141	build models of Na and Cl and use them to explain bonding
					145	plan a procedure and select necessary equipment
					145	carry out procedure and select equipment
					146	safety in the lab
					146	record detailed observations
					150	chemistry safety
					150	record data as you perform experiment
					151	perform the experiment you designed
					151	select materials from list
					151	design experiment to find out if mass is conserved
					151	explain how hypothesis compares to results
					151	plan procedures and select materials

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					158	wear goggles and apron
					168	safety equipment
					170	which factor will produce fastest dissolving rate?
					170	devise hypothesis and explain
					170	what three factors influence dissolving rate?
					171	evaluate method based on data
					172	hot water safety
					177	research pH indicators
					178	visit local water supply and perform testing
					180	safety tip for water testing
					180	researching where your water comes from
					182	observing daphnia and recording movements and behavior
					182	safety tips for observing Daphnia
					182	simulating the effect of acid rain on daphnia
					182	making hypotheses and testing them against observations

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					185	analyzing the results of the buffered acid experiment
					186	thermometer safety
					188	conducting investigation of efficiency of immersion heater
					188	heat safety
					190	effect of changing mass on collected data
					190	effect of changing mass on data
					192	heat safety
					193	explaining efficiency of heat transfer based on data
					193	conducting experiments on heat transfer
					194	design and construct an aneroid barometer
					197	identifying relationships between air pressure and weather
					198	making qualitative observations of the amount of ozone present in the school environment
					199	collecting Schönbein strips for detecting ozone

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					200	evaluating your qualitative ozone strips
					201	researching the causes of ozone
					202	collecting data of temperature and sensations
					202	safety in greenhouse gas investigation
					205	investigating how specific heat of water regulates Earth's temperature
					206	collecting temperature and time data
					206	identifying relationship between percent of Earth covered in water and temperature range
					207	researching how bodies of water affect climate
					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
					210	collecting qualitative data of light intensity at scale distance from the sun

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					210	safety using light bulbs
					211	determining whether distance from light source or axial tilt plays a more significant role in causing the seasons
					216	safety in swinging thermometers
					217	collecting wet and dry bulb temperature readings
					222	researching an animal that is adapted to live in the biome you studied
					224	reconstruct a series of events from clues
					224	sequencing events
					227	researching forensic science
					233	identifying how the earthquake model represents an earthquake
					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

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					237	develop a research plan for studying volcanoes
					241	justify which scenario was most likely
					243	recording observations of crystal growing
					251	recording the changes in the moon over a month
					252	identifying the parts of a refracting telescope and making observations of the moon's surface
					256	safety in lab
					256	investigation discovering relationship between orbital speed and distance

Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
Student Text and Investigation Manual

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
INQ01.3 Inquiry	Abilities Necessary to do Scientific Inquiry	Use technology and mathematics to improve investigations and communications	5	measuring distance		data tables and graphs can be created on computer or graphing calculator
			11	controlling variables in experiments		
			12	importance of reliable and accurate data collection	4	difference between precise and accurate data
			19	did you run a controlled experiment?	6	electronic timer and release technique
			20	what factors could explain the variability in their data?	6	compare results with other groups
			24	interpretations of patterns in data	7	record time interval
			27	reading a graph	9	construct a data table
			31	determining slope of a line	9	collect speed data
			38	determining slope of a line	11	use your graph to predict speed
			42	analyze a speed/distance graph	11	analyze speed change of car
			78	analyze lever diagram	11	graph speed vs. position
					11	calculate % error
					12	understand and use data table
					15	interpret a speed vs. time graph
					15	calculating acceleration from the slope of the line
					17	record results in data table
					17	record times

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					18	study data table for relationship between force and motion
					18	organize different combinations of data
					21	think about percent change
					24	use data table to record results
					24	collect weight data
					25	analyze block and tackle data
					27	analyze lever equilibrium data
					27	use data table to record results
					30	record ropes and pulley data in table
					35	does data support hypothesis?
					36	organize data into a table
					36	collect precise speed and height data
					45	did battery voltage change?
					75	create data table for self-designed experiment
					75	collect mass and amplitude data

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					76	calculate % error
					76	analyze pendulum data
					147	students analyze chemical change lab results
					151	design a data table
					169	what does the word control mean?
					169	why was plain water tested?
					171	use data table for observations
					171	average dissolving rate
					171	collect time data and record observations
					181	organize water quality data into a table
					182	making detailed observations
					184	collecting pH readings while adding carbon dioxide
					186	measure temperature
					186	collecting temperature data
					187	find slope of a trend line
					189	collecting time and temperature data

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					189	calculate slope of a graph
					193	collecting and recording time and temperature data
					197	calculating error between your barometer and a commercial barometer
					199	importance of good record keeping in order to avoid error
					217	determining relationship between temperature of the atmosphere and relative humidity
					218	interpreting Doppler radar images
					237	finding a pattern of volcanoes on a bathymetric map
					249	using your sundial to collect accurate data
					253	calibrating your telescope

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
INQ01.4 Inquiry	Abilities Necessary to do Scientific Inquiry	Formulate and revise scientific explanations and models using logic and evidence	23	why make models?	13	graph distance vs. time
			24	scientific models	15	construct a quantitative graphical model
			24	what is a scientific model?	21	construct reasonable explanation based on data
			24	making a graph	25	create a mathematical model
			26	creating graphs	27	find math rule for lever equilibrium
			41	make a graph	28	derive a math formula
			42	interpreting distance/time graph	35	study data and determine importance of height on speed of marble
			524	model of Earth's history	37	organize data into a graph of speed vs. height
					45	analyze data and explain a rule
					51	graph voltage vs. current
					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
		157	add new rules to list based on findings			

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					171	what was happening at molecular level?
					185	constructing a graph of drops of acid vs pH
					187	construct a graphical model
					187	find equation for trend line
					189	construct a temperature vs. time graph
					197	constructing a graph from atmospheric pressure data
					197	evaluating your aneroid barometer design
					202	modeling the effect of greenhouse gases on Earth's temperature
					203	graphing water and ice temperature readings
					206	constructing a graph of time vs. temperature
					212	modeling underwater rivers and waterfalls and springs
					231	evaluating your completed bathymetric map
					232	construct a model that simulates an earthquake

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					247	evaluate your ability to interpret rock formations
					257	inverse square law
					258	setting up a scale model of the solar system
INQ01.5 Inquiry	Abilities Necessary to do Scientific Inquiry	Recognize and analyze alternative explanations and models	10	process of reviewing hypothesis explained	35	what evidence is there in support of your hypothesis?
			521	relative dating and modern geology based on Steno's theories	39	critique group's explanation of energy transformations
			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
			529	critiquing Wegener's theories of continental drift	77	show how energy loss data could be applied to designing a real clock
			563	Darwin's theories of the Andes formation	77	compare law of conservation of energy to motion of pendulum
			566	what causes ice ages	151	review your hypothesis
			611	theories of origin of the moon	171	did you prove or disprove your hypothesis?
			612	early theories of the solar system		
			647	Big Bang theory		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
INQ01.6 Inquiry	Abilities Necessary to do Scientific Inquiry	Communicate and defend a scientific argument	20 27	explain your reasoning how to read a graph		vocabulary is presented in context of investigations students are encouraged to keep a lab notebook 9 present conclusions to the class 9 reporting on an experiment 37 describe the flow of energy based on experimental graph 39 give a brief presentation to the class 41 drawing and interpreting circuit diagrams 47 present and defend an explanation 78 reading harmonic motion data tables and graphs 145 present findings to the class 145 present findings and methods used 151 present results to the class 179 create water quality report 181 write paragraph to explain results

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					183 writing up a lab report 183 write summary of findings	

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
INQ02.1 Inquiry	Understandings About Scientific Inquiry	Scientists usually inquire about how physical, living, or designed systems function. Conceptual principles and knowledge guide scientific inquiries. Historical and current scientific knowledge influence the design and interpretation of investigations...	34	Newton and the history of physics	163	evaluating choice of favorite car
			34	Newton's research impacted mathematics	198	contributions of Schönbein
			45	Newton's discovery of the 2nd law		
			45	Newton's Principia		
			46	oldest known standard weight		
			55	Newton and the apple legend		
			73	impact of technology		
			73	impact of Da Vinci's work		
			73	Leonardo DaVinci		
			86	James Watt		
			110	research Franklin's electricity experiments		
			115	Volta's batteries		
			131	Georg Ohm's work with circuits		
			134	history of superconductivity		
			160	Faraday's contributions		
			161	history of magnetism		
			312	history of atomic theory		
312	Dalton's contributions					
320	the quests of alchemists					

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
			321	Mendeleev's periodic table		
			332	Linus Pauling and electronegativities		
			343	Avogadro's number		
			363	Antoine Lavoisier		
			363	history of law of conservation of mass		
			370	research Lavoisier's contributions		
			391	scientific discovery and the atomic age		
			393	Marie and Pierre Curie		
			393	accomplishments of Marie Curie		
			393	history of nuclear chemistry		
			395	impact of industrial revolution		
			400	research the Clean Air Act of 1970 and 1990		
			443	impact of carbon dioxide on life in the oceans		
			448	research local water supply history		
			455	contributions of Joule		
			457	Joseph Black		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
			468	research the history of heat and temperature		
			479	scientists detect loss of ozone in atmosphere		
			482	effects of global warming discovered		
			496	tracking ocean currents		
			511	trees and global climate		
			542	studying seismic waves leads to information used in oil and gas exploration		
			545	predicting tsunamis		
			568	urban sprawl		
			583	history of calendars		
			585	counting the days in a year		
			586	the history of clocks and the division of time		
			589	ancient beliefs about solar eclipses		
			594	history of the telescope		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
INQ02.2 Inquiry	Understandings About Scientific Inquiry	Scientists conduct investigations for a wide variety of reasons. For example, they may wish to discover new aspects of the natural world, explain recently observed phenomena, or test the conclusions of prior investigations or the predictions of current...	58	Newton on a skateboard	6	asking questions and learning about natural world
			78	describe a problem that would be solved by an engineer	39	study energy transformations in daily life scenarios
			120	circuits in your house	179	researching and preparing for a field trip to test surface water
			452	balloons expands or contracts due to thermal expansion	197	evaluating the relationship between atmospheric pressure and weather
			454	temperature vs. thermal energy for a cup or pot of soup	201	suggesting ways that ozone concentrations could be reduced
			461	understanding thermal energy through cocoa example	204	connecting the latent heat investigation to Earth
			463	convection and sea breezes	215	the food paradox of the oceans
			465	examples of reflectors and absorbers	218	understanding Doppler radar
			473	why do ears pop		
			473	why do ears pop		
			476	atmospheric pressure in Denver		
			489	patterns of heating and cooling on Earth		
			490	using the North Star to estimate your latitude		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
			504	meteorologists use atmospheric pressure data to understand movement of weather systems		
			508	patterns in storm activity across the globe		
			509	how do animals survive in the desert		
			533	patterns of earthquakes and volcanoes		
			536	analogy of plate movements		
			540	boundaries of tectonic plates		
			553	the Ring of Fire		
			584	lunar cycles		
			609	tides		
			637	categorizing stars with H-R diagrams		
			648	evidence for Big Bang theory		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
INQ02.3 Inquiry	Understandings About Scientific Inquiry	Scientists rely on technology to enhance the gathering and manipulation of data. New techniques and tools provide new evidence to guide inquiry and new methods to gather data, thereby contributing to the advance of science. The accuracy and precision of..	5 12 24	measuring distance importance of reliable and accurate data collection using an electronic timer	4 6 7 9 12 14 16 17 17 18 24 30 36 44 46 48 50	data tables and graphs can be created on computer or graphing calculator difference between precise and accurate data electronic timer and release technique record time interval collect speed data using photogates using photogates use a force scale use photogates to study car on ramp record times use a balance to find mass of car collect weight data use force scale collect precise speed and height data using electrical meter using electrical meter using electrical meter using electrical meter

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					75	collect mass and amplitude data
					86	use CPO Timer to measure frequency
					107	study reflection of laser beam
					108	study refraction of laser beam
					113	trace critical angle with a laser beam
					158	use a thermometer
					171	collect time data and record observations
					182	making detailed observations
					184	collecting pH readings while adding carbon dioxide
					186	collecting temperature data
					186	measure temperature
					189	collecting time and temperature data
					193	collecting and recording time and temperature data
					249	using your sundial to collect accurate data
					253	calibrating your telescope

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
INQ02.4 Inquiry	Understandings About Scientific Inquiry	Mathematics is essential in scientific inquiry. Mathematical tools and models guide and improve the posing of questions, gathering data, constructing explanations and communicating results.	42	interpreting distance/time graph	25 27 28 187 257	create a mathematical model find math rule for lever equilibrium derive a math formula find equation for trend line inverse square law

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
INQ02.5 Inquiry	Understandings About Scientific Inquiry	Scientific explanations must adhere to criteria such as: a proposed explanation must be logically consistent; it must abide by the rules of evidence; it must be open to questions and possible modification; and it must be based on historical and current...	19	which group did the best experiment?	18	evaluate graphs as to whether or not they show relationships between variables
			20	how will speed change?	21	evaluate percent change for data collected
			24	predicting speed from a graph	21	construct reasonable explanation based on data
			42	predict the speed of a car	21	study data and determine importance of height on speed of marble
					35	analyze data and explain a rule
					45	evaluate statistical significance
					75	use data to predict best string length for a pendulum clock
					76	use graph to predict mass of six objects
					121	do the data support the hypothesis
					151	make predictions about solubility
					156	evaluate method based on data
					171	what was happening at molecular level?
					171	evaluating your qualitative ozone strips
					200	

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					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
INQ02.6 Inquiry	Understandings About Scientific Inquiry	Results of scientific inquiry- new knowledge and methods- emerge from different types of investigations and public communication among scientists. In communicating and defending the results of scientific inquiry, arguments must be logical and demonstrate...	23	why make models?	163	evaluating choice of favorite car
			24	scientific models	202	modeling the effect of greenhouse gases on Earth's temperature
			24	what is a scientific model?	212	modeling underwater rivers and waterfalls and springs
			524	model of Earth's history	232	construct a model that simulates an earthquake
					258	setting up a scale model of the solar system

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS01.1 Physical Science	Structure of Atoms	Matter is made of minute particles called atoms, and atoms are composed of even smaller components. These components have measurable properties, such as mass and electrical charge...	311	all matter is formed from atoms	132	comparing atoms
			311	all matter is formed from atoms	132	building atom models
			311	location/size/charge of subatomic particles	133	location of electrons in atom
			311	protons/neutrons/electrons	133	protons and neutrons
			318	proton/electron attraction	136	strong force
			389	forces in the nucleus	136	model stable and neutral atoms
			389	electromagnetic force	137	build atomic models
			389	strong nuclear force	140	review subatomic particles

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail	
PS01.2 Physical Science	Structure of Atoms	The atom's nucleus is composed of protons and neutrons, which are much more massive than electrons. When an element has atoms that differ in the number of neutrons, these atoms are called different isotopes of the element.	311	location/size/charge of subatomic particles	133	exploring isotopes	
			311	protons/neutrons/electrons	133	identify atomic number	
			315	atomic number discussed	133	identify mass number	
			315	atoms of same element have same atomic number	133	identify element symbol and name	
			316	isotopes explained	133	location of electrons in atom	
			316	mass number discussed	133	protons and neutrons	
			322	chemical symbols and element names	136	understanding isotopes	
			322	atomic number on the periodic table	136	atomic number	
			322	atomic mass on the periodic table	136	mass number	
			322	atomic mass on the periodic table	137	importance of atomic number	
				137	build atomic models		
						140	review subatomic particles

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS01.3 Physical Science	Structure of Atoms	The nuclear forces that hold the nucleus of an atom together, at nuclear distances, are usually stronger than the electric forces that would make it fly apart. Fission is the splitting of a large nucleus, Fusion is the joining of two nuclei...	387 389 389 389 623	fusion and fission explained forces in the nucleus electromagnetic force strong nuclear force nuclear fusion and the sun	136 138	strong force fusion and fission
PS01.4 Physical Science	Structure of Atoms	Radioactive isotopes are unstable and undergo spontaneous nuclear reactions, emitting particles and/or wavelike radiation. The decay of any one nucleus cannot be predicted...	388 393 393 400	nuclear vs chemical reactions radioisotopes in science and medicine carbon dating research pros and cons of nuclear technology	138 160 160 161	nuclear reactions radioactive decay how do you simulate nuclear decay? research pros and cons of uses for radioactive elements

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS02.1 Physical Science	Structure and Properties of Matter	Atoms interact with one another by transferring or sharing electrons that are furthest from the nucleus. These outer electrons govern the chemical properties of the element.	324	which element is more likely to combine with other elements?	140	find the number of electrons in outermost level
			324	use the periodic table to predict chemical formulas	141	modeling a chemical bond
			335	chemical bonding and the periodic table		
			388	showing valence electrons in a diagram		
PS02.2 Physical Science	Structure and Properties of Matter	An element is composed of a single type of atom. When elements are listed in order according to the number of protons (called the atomic number), repeating patterns of physical and chemical properties identify families of elements with similar...	321	groups of elements and valence shells	141	build model of Na and Cl atoms and explain why they bond to form a molecule
			329	periodic table columns and valence electrons		
			330	bonding and periodic table position	142	arrangement of electrons and groups of elements
			332	periodic table and electronegativities		
			335	periodic table and oxidation numbers		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS02.3 Physical Science	Structure and Properties of Matter	Bonds between atoms are created when electrons are paired up by being transferred or shared. A substance composed of a single kind of atom is called an element...	278	compounds are composed of elements	136	ions
			324	which element is more likely to combine with other elements?	140	who do atoms form chemical bonds?
			324	use the periodic table to predict chemical formulas	141	whan an atom ionizes
			330	ionic bonds	141	modeling a chemical bond
			331	covalent bonds	142	who 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	name chemical compounds
			336	writing a chemical formula	143	predict chemical formulas
			338	summary of chemical formula writing rules	143	ionic compounds
			339	naming compounds	144	show ratios in which elements combine to form a compound
			343	mole quantities	145	determine empirical formula
			364	carbon chains	162	carbon reactions and the environment
			409	dissolving an ionic compound		
			410	solute dissolution depends on chemical bonds		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS02.4 Physical Science	Structure and Properties of Matter	The physical properties of compounds reflect the nature of the interactions among its molecules. These interactions are determined by the structure of the molecule, including the constituent atoms and the distances and angles between them.	403 403 409	a water molecule is v-shaped water structure and its function as a solvent why water is called the universal solvent		
PS02.5 Physical Science	Structure and Properties of Matter	Solids, liquids, and gases differ in the distances and angles between molecules or atoms and therefore the energy that binds them together. In solids the structure is nearly rigid; in liquids molecules or atoms move around each other but...	284 285 405	states of matter and arrangement of molecules characteristics of matter related to its state molecular structure of ice	118 118 118 118	observe melting process and study quantitatively investigate melting molecules in a liquid think of melting process at molecular level

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS02.6 Physical Science	Structure and Properties of Matter	Carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures, including synthetic polymers, oils, and the large molecules essential to life	364	carbon chains	162	carbon reactions and the environment
PS03.1 Physical Science	Chemical Reactions	Chemical reactions occur all around us, for example in health care, cooking, cosmetics, and automobiles. Complex chemical reactions involving carbon-based molecules take place constantly in every cell in our bodies.	361 378 378 381 395 395 397 419 438	chemical reactions in living systems combustion reactions consumer chemistry MRE ration heater reaction chemistry of the atmosphere chemistry of the atmosphere carbon reactions dissociation of water chemical reactions and the formation of acid rain	148 162	chemical equations investigating combustion reactions

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS03.2 Physical Science	Chemical Reactions	Chemical reactions may release or consume energy. Some reactions such as the burning of fossil fuels release large amounts of energy by losing heat and by emitting light. Light can initiate many chemical reactions such as ...	381 382	exothermic reactions and MREs endothermic reactions and cold packs	158 158	investigate energy changes in chemical reactions measure energy changes in 3 different reactions
PS03.3 Physical Science	Chemical Reactions	A large number of important reactions involve the transfer of either electrons (oxidation/reduction reactions) or hydrogen ions (acid/base reactions) between reacting ions, molecules, or atoms. In other reactions, chemical bonds...	418 420 422 422 437 437	formulas and reactions of acids and bases concentration of hydronium ions determines pH and strength of acids and bases pH and blood examples of acid and base chemistry concentration of ions and pH pH of acid rain	176	measure pH of everyday solutions

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS03.4 Physical Science	Chemical Reactions	Chemical reactions can take place in time periods ranging from the few femtoseconds (10-15 seconds) required for an atom to move a fraction of a chemical bond distance to geologic time scales of billions of years. Reaction rates depend...	364	formation of petroleum is a very slow chemical reaction	156	predict products in a double displacement reaction
PS03.5 Physical Science	Chemical Reactions	Catalysts, such as metal surfaces, accelerate chemical reactions. Chemical reactions in living systems are catalyzed by protein molecules called enzymes.	364 422	formation of petroleum is a very slow chemical reaction acids and bases and enzymes in digestion	156	predict products in a double displacement reaction

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS04.1 Physical Science	Motion and Forces	Objects change their motion only when a net force is applied. Laws of motion are used to calculate precisely the effects of forces on the motion of objects. The magnitude of the change in motion can be calculated using the...	14	how to calculate speed	8	calculating speed
			20	find speed of bumblebee	9	collect data and calculate speed of car
			20	calculate speed of car	10	calculate speed of the car
			24	accurate speed measurements	12	find speed of car at different positions
			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
			42	calculate speed from distance/time graph	14	exploring acceleration on a ramp
			45	Newton's first law summarized	16	thinking about force
			45	Newton's third law summarized	16	unbalanced forces and acceleration of car
			45	Newton's second law summarized	17	caclulate speed of car
			46	force has potential to change motion	19	find correct relationship between force mass and acceleration
			48	Newton's first law in detail	19	discover 2nd law of motion
			49	force is related to acceleration	22	car and ramp and Newton's 3rd law
			49	Newton's second law in detail	23	using 3rd law to explain common phenomena
			51	balanced and unbalanced forces	24	measure force in newtons
			59	Newton's third law in detail	36	find speed of marble

**Correlation to NRC National Science Education Standards with Inquiry
Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
			64	solving problems using f=ma		
			69	newtons and pounds		
PS04.2 Physical Science	Motion and Forces	Gravitation is a universal force that each mass exerts on any other mass. The strength of the gravitational attractive force between two masses is proportional to the masses and inversely proportional to the square of the distance between them.	52	gravity depends on mass	20	investigate effect of gravity on motion
			52	the effect of gravity	257	relating the relationship between orbital speed and distance to the equation of universal gravitation
			54	Newton's law of universal gravitation		
			55	calculating gravitational force between objects		
			606	Newton's law of universal gravitation		
PS04.3 Physical Science	Motion and Forces	The electric force is a universal force that exists between any two charged objects. Opposite charges attract while like charges repel. The strength of the force is proportional to the charges, and, as with gravitation, inversely proportional...	105	charge is a fundamental property of matter	42	investigate electric charge
			106	static charge discussed		
			106	electrical force is incredibly strong!		
			106	electrical forces		
			107	explanation of coulomb		
			108	electroscopes		
			108	how an electroscope works		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS05.1 Physical Science	Conservation of Energy and the Increase in Disorder	The total energy of the universe is constant. Energy can be transferred by collisions in chemical and nuclear reactions, by light waves and other radiations, and in many other ways. However, it can never be destroyed. As these transfers...	88 90 91 91 92 93 96 454	potential and kinetic energy explained conservation of energy explained understand basic forms of energy energy conversions energy transformations and conservation different forms of energy described prove that energy is conserved changes in temperature are directly related to changes in energy	37 38 38 39 147 188	investigating conservation of energy with rollercoaster explore energy transformations conservation of energy and energy transformations identify type of energy involved feel the heat generated by chemical reaction investigate the increase of temperature of water as thermal energy is added
PS05.2 Physical Science	Conservation of Energy and the Increase in Disorder	All energy can be considered to be either kinetic energy, which is the energy of motion; potential energy, which depends on relative position; or energy contained by a field, such as electromagnetic waves.	88 90 92 93 96	potential and kinetic energy explained conservation of energy explained energy transformations and conservation different forms of energy described prove that energy is conserved	36 37 38	energy conservation and the roller coaster investigating conservation of energy with rollercoaster conservation of energy and energy transformations

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS05.3 Physical Science	Conservation of Energy and the Increase in Disorde	Heat consists of random motion and the vibrations of atoms, molecules, and ions. The higher the temperature, the greater the atomic or molecular motion.	454	temperature and thermal energy and heat	188	relationship between heat and temperature
PS05.4 Physical Science	Conservation of Energy and the Increase in Disorde	Everything tends to become less organized and less orderly over time. Thus, in all energy transfers, the overall effect is that the energy is spread out uniformly. Examples are the transfer of energy from hotter to cooler objects by ...	462 462 463 463 464 465 465 482 493	heat transfer through air densely packed solids are good conductors of heat 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

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS06.1 Physical Science	Interactions of Energy and Matter	Waves, including sound and seismic waves, waves on water, and light waves, have energy and can transfer energy when they interact with matter.	195	waves transmit energy	82	study wave pulses on elastic cord
			197	transverse and longitudinal waves	83	find speed of a wave
			198	frequency and wavelength and amplitude	83	measure speed of a wave pulse
			201	waves and absorption	84	make different types of waves in a ripple tank
			201	waves and refraction	85	observing reflection in water waves
			201	reflection in water waves and light waves	86	investigate frequency and wavelength
			201	waves and reflection	86	adjust frequency of a standing wave
			202	refraction and eyeglasses	87	investigating resonance
			204	resonance explained	88	natural frequency and resonance of standing waves on a string
			205	standing waves on a string	90	what is sound and how do we hear it?
			206	constructive and destructive interference	94	does sound behave like other waves?
			210	can wave interference sink a ship?	95	investigate interference with sound waves
			210	natural frequency of a building and earthquakes	95	interference and sound waves
			215	properties of sound waves	96	investigating sound resonance
			219	frequency of sound and pitch	101	examine light through diffraction grating
			221	importance of wavelength of sound waves		
			222	effect of temperature on speed of sound wave		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
			222	effect of medium on speed of sound wave	102	polarization of a spring wave
			223	interference of sound waves	102	polarization of water waves
			225	consonance and dissonance and beats	103	polarization of light
			240	polarization of light	108	explore refraction with a prism
			242	properties of light waves	265	an element's spectral lines correspond to specific wavelengths of light
			242	color and frequency of light waves		
			261	refraction and lenses		
			480	electromagnetic radiation		
			480	energy and radiation relationships		
			538	body waves		
			626	the sun's energy reaches Earth in the form of electromagnetic waves		

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS06.2 Physical Science	Interactions of Energy and Matter	Electromagnetic waves result when a charged object is accelerated or decelerated. Electromagnetic waves include radio waves (the longest wavelength), microwaves, infrared radiation (radiant heat), visible light, ultraviolet radiation...	196 237 237 237 237 250 272 479	waves are all around us visible light and the electromagnetic spectrum light waves and the electromagnetic spectrum radio and television signals microwave ovens identify uses of electromagnetic waves identify uses of electromagnetic waves ultraviolet and infrared light	134	investigating visible light with a spectrometer
PS06.3 Physical Science	Interactions of Energy and Matter	Each kind of atom or molecule can gain or lose energy only in particular discrete amounts and thus can absorb and emit light only at wavelengths corresponding to these amounts. These wavelengths can be used to identify the substance.	234 242 319	electrons and energy levels and light emission color and frequency of light waves fireworks displays and electron excitation	134 135 265 265	using a spectrometer observing different light sources with a spectrometer an element's spectral lines correspond to specific wavelengths of light an element's spectral lines correspond to specific wavelengths of light

**Correlation to NRC National Science Education Standards with Inquiry
 Foundations of Physical Science with Earth and Space Science
 Student Text and Investigation Manual**

Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
PS06.4 Physical Science	Interactions of Energy and Matter	In some materials, such as metals, electrons flow easily, whereas in insulating materials such as glass they can hardly flow at all. Semiconducting materials have intermediate behavior. At low temperatures some materials become superconductors...	121	electrical conductivity explained	49	conductivity of aluminum vs. copper