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Introduction to Earth and Space Science

Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.1.A1 by end of grade 8	Scientific Processes	Habits of Mind	Evaluate the strengths and weaknesses of data, claims, and arguments.	92	study claims made by bottled water companies	43	study water filtration device claims
08.5.1.A2 by end of grade 8	Scientific Processes	Habits of Mind	Communicate experimental findings to others.			41 43 45	create water quality report write paragraph to explain results write summary of findings
08.5.1.A3 by end of grade 8	Scientific Processes	Habits of Mind	Recognize that the results of scientific investigations are seldom exactly the same and that replication is often necessary.	37 117 121 179	what percentage comes from this source? (problem 4) determining distance to an epicenter what explains the difference in density? (#5) how big is Earth?	13 15	calculating error between your barometer and a commercial barometer importance of good record keeping in order to avoid error
08.5.1.A4 by end of grade 8	Scientific Processes	Habits of Mind	Recognize that curiosity, skepticism, open-mindedness, and honesty are attributes of scientists	7 9	contributions of Joule Joseph Black		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.1.B1 by end of grade 8	Scientific Processes	Inquiry and Problem Solving	Identify questions and make predictions that can be addressed by conducting investigations.	3	what is temperature	17	predicting areas with high ozone concentration based on your data
				8	asking questions pertaining to specific heat and heat flow	20	predicting what would happen if you place your ice/water test tube into a hot cup or a cold cup
				24	why is Earth's atmosphere different from other planets	63	estimating the number of meteor collisions on Earth during the last 3.5 billion years
				25	why do ears pop	66	predicting the results of the crystal-growing experiment
				44	why does Earth have seasons		
				53	how does rain form		
				61	how do animals survive in the desert		
				67	what is a carbon sink		
				73	why haven't we run out of water		
				78	what is in your tap water		
				81	what is acid rain		
				85	why are oceans salty		
				108	why doesn't Earth get bigger and bigger		
				162	what causes eclipses		
				195	is Pluto a planet		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.1.B2 by end of grade 8	Scientific Processes	Inquiry and Problem Solving	Design and conduct investigations incorporating the use of a control.			21	investigating how specific heat of water regulates Earth's temperature
						27	determining whether distance from light source or axial tilt plays a more significant role in causing the seasons
						4	conducting investigation of efficiency of immersion heater
						44	simulating the effect of acid rain on daphnia
						57	identifying how the earthquake model represents an earthquake
						6	effect of changing mass on collected data
						9	conducting experiments on heat transfer

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.1.B3 by end of grade 8	Scientific Processes	Inquiry and Problem Solving	Collect, organize, and interpret the data that results from experiments.	28	atmospheric pressure at various altitudes graph	13	constructing a graph from atmospheric pressure data
				38	observing an aurora	15	collecting Schönbein strips for detecting ozone
				79	making observations and asking questions	18	collecting data of temperature and sensations
				152	Moh's hardness scale	19	graphing water and ice temperature readings
				204	what evidence was used to predict the existence of the Kuiper Belt?	2	collecting temperature data
				204	use the data to answer the questions	2	measure temperature
				219	apparent brightness vs. distance graph	22	constructing a graph of time vs. temperature
				225	use the diagram to answer the questions (#2)	22	collecting temperature and time data
				225	arrange the items in the table (#3)	26	collecting qualitative data of light intensity at scale distance from the sun
				225	use the diagram to answer the questions (#4)	3	construct a graphical model
				226	analysis with a spectrometer (#4)	33	determining relationship between temperature of the atmosphere and relative humidity
						33	collecting wet and dry bulb temperature readings
						34	interpreting Doppler radar images

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
						43	organize water quality data into a table
						44	observing daphnia and recording movements and behavior
						44	making detailed observations
						46	collecting pH readings while adding carbon dioxide
						47	constructing a graph of drops of acid vs pH
						5	collecting time and temperature data
						5	construct a temperature vs. time graph
						61	finding a pattern of volcanoes on a bathymetric map
						67	recording observations of crystal growing
						73	using your sundial to collect accurate data
						75	recording the changes in the moon over a month
						77	calibrating your telescope
						9	collecting and recording time and temperature data

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.1.C1 by end of grade 8	Scientific Processes	Safety	Know when and how to use appropriate safety equipment with all classroom materials.	4	safety caution on heating jar	18 2 26 32 4 42 44 8 80 vi	safety in greenhouse gas investigation thermometer safety safety using light bulbs safety in swinging thermometers heat safety safety tip for water testing safety tips for observing Daphnia heat safety safety in lab safety in the laboratory
08.5.1.C2 by end of grade 8	Scientific Processes	Safety	Understand and practice safety procedures for conducting science investigations.	4	safety caution on heating jar	18 2 26 32 4 42 44 8 80 vi	safety in greenhouse gas investigation thermometer safety safety using light bulbs safety in swinging thermometers heat safety safety tip for water testing safety tips for observing Daphnia heat safety safety in lab safety in the laboratory

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.2.A1 by end of grade 8	Science and Society	Cultural Contributions	Recognize that scientific theories: develop over time, depend on the contributions of many people, and reflect the social and political climate of their time.	157 159 160 163 168	history of calendars counting the days in a year the history of clocks and the division of time ancient beliefs about solar eclipses history of the telescope	14	contributions of Schönbein
08.5.2.A2 by end of grade 8	Science and Society	Cultural Contributions	Know that scientists are men and women of many cultures who often work together to solve scientific and technological problems.	7 9	contributions of Joule Joseph Black		
08.5.2.A3 by end of grade 8	Science and Society	Cultural Contributions	Describe how different people in different cultures have made and continue to make contributions to science and technology.	7 9	contributions of Joule Joseph Black		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.2.B1 by end of grade 8	Science and Society	Historical Perspectives	Describe the impact of major events and people in the history of science and technology, in conjunction with other world events.	157	history of calendars	14	contributions of Schönbein
				159	counting the days in a year		
				160	the history of clocks and the division of time		
				163	ancient beliefs about solar eclipses		
				168	history of the telescope		
08.5.2.B2 by end of grade 8	Science and Society	Historical Perspectives	Describe the development and exponential growth of scientific knowledge and technological innovations.	35	hydrogen powered cars		
				77	the clean water act		
				83	catalytic converters and scrubbing reduce acid rain		
				104	using echo sounders to map the sea floor		
				112	what we can learn from seismographs		
				118	understanding earhquakes allows engineers to design safer buildings		
				171	using satellite technology		
				173	space shuttle		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.3.A1 by end of grade 8	Mathematical Applications	Numerical Operations	Express quantities using appropriate number formats, such as decimals, percents and scientific notation.	164 166 175 180	astronomic numbers expressed in scientific notation calculating light year using scientific notation converting numbers to scientific notation determining Earth's mass using scientific notation	95	calculating solar brightness units (SBU) from kilometers in scientific notation
08.5.3.B1 by end of grade 8	Mathematical Applications	Geometry and Measurement	Perform mathematical computations using labeled quantities and express answers in correctly derived units.	166	unit conversion in calculating light years	82	determining scale distances
08.5.3.C1 by end of grade 8	Mathematical Applications	Patterns and Algebra	Express physical relationships in terms of mathematical equations derived from collected data.	11 219	heat equation inverse square law	3 81	find equation for trend line inverse square law

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.3.D1 by end of grade 8	Mathematical Applications	Data Analysis and Probability	Represent and describe mathematical relationships among variables using graphs and tables.			13 19 22 3 43 47 5	constructing a graph from atmospheric pressure data graphing water and ice temperature readings constructing a graph of time vs. temperature construct a graphical model organize water quality data into a table constructing a graph of drops of acid vs pH construct a temperature vs. time graph
08.5.3.D2 by end of grade 8	Mathematical Applications	Data Analysis and Probability	Analyze experimental data sets using measures of central tendency mean, mode, and median.	121 192	average density (#5) average distance from the sun		
08.5.3.D3 by end of grade 8	Mathematical Applications	Data Analysis and Probability	Construct and use a graph of experimental data to draw a line of best fit and identify a linear relationship between variables when appropriate.			13 3	graphing and drawing a trend line for atmospheric pressure data draw a line of best fit through temperature data points

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.3.D4 by end of grade 8	Mathematical Applications	Data Analysis and Probability	Use computer spreadsheets, graphing and database applications to assist in quantitative analysis of data.		featured throughout CPO Science program		data tables and graphs can be created using computer spreadsheets
08.5.4.A1 by end of grade 8	Nature and Process of Technology	Science and Technology	Compare and contrast science with technology, illustrating similarities and differences between these two human endeavors.	104 171 173	using echo sounders to map the sea floor using satellite technology space shuttle		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.4.B1 by end of grade 8	Nature and Process of Technology	Nature of technology	Analyze a product or system to determine the problem it was designed to solve, the design constraints, trade-offs and risks involved in using the product or system, how the product or system might fail, and how the product or system might be improved.			10 10 38 38 56 56 70 70 73 73	build your own atmospheric pressure gauge design and construct an aneroid barometer design a scale model of a zoo desisgn a scale model of a zoo simulate an earthquake simulate an earthquake design a metamorphism simulation design a metamorphism simulation design a sundial design a sundial
08.5.4.C1 by end of grade 8	Nature and Process of Technology	Technological Design	Recognize how feedback loops are used to control systems.	12 73 79 82	thermal equilibrium the water cycle pond ecosystem and water quality acid rain formation system		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.7.B1 by end of grade 8	Physics	Energy Transformations	Recognize that the sun is a major source of the Earth's energy and that solar energy includes visible, infrared and ultraviolet radiation.	31 32 33 37 197 200	ultraviolet and infrared light distribution of incoming solar radiation Earth’s "energy budget" Earth’s internal energy energy from the sun harnessing the sun’s energy		
08.5.7.B2 by end of grade 8	Physics	Energy Transformations	Describe the nature of various forms of energy, including heat, light, sound, chemical, mechanical, and electrical and trace energy transformations from one form to another.	197 200	energy from the sun harnessing the sun’s energy		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.7.B3 by end of grade 8	Physics	Energy Transformations	Describe how heat can be conducted through materials or transferred across space by radiation and know that if the material is a fluid, convection currents may aid the transfer of heat.	14	densely packed solids are good conductors of heat	8	investigate convection in liquids
				14	heat transfer through air		
				15	warming hands over candle		
				15	convection currents and weather		
				16	convection currents in water		
				17	transfer of heat by radiation		
				17	solid road surface emits radiation		
				34	global warming and heat transfer by radiation		
				45	apply knowledge of heat transfer to different situations		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.8.A1 by end of grade 8	Earth Science	Earth's Properties and Materials	Observe that most rocks and soils are made of several substances or minerals.	107	activity of Earth's crust at plate boundaries	61	examining the magma chemistry of volcanoes and how it relates to a volcano's location
				108	balance of creating and consuming Earth's crust	66	understanding how igneous rocks are formed and growing crystals to investigate their formation
				128	properties of volcanically formed rock	68	understanding how sedimentary rocks are formed and creating sedimentary deposits to investigate them
				133	types of volanic rock	70	understanding and investigating how metamorphic rocks are formed
				135	describing volcanic rock	71	interpreting how different rock formations were formed
				136	constructive and destructive processes		
				136	constructive and destructive processes		
				139	formation of soil		
				144	properties of minerals		
				145	common minerals		
				146	Mohs hardness scale		
				147	formation of igneous and sedimentary and metamorphic rocks		
				149	identifying igneous and sedimentary and metamorphic rocks		
				150	the rock cycle		
				150	the rock cycle		

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.8.A2 by end of grade 8	Earth Science	Earth's Properties and Materials	Observe that the properties of soil vary from place to place and will affect the soil's ability to support life.	107	activity of Earth's crust at plate boundaries	64	estimating the effects of meteor impacts on Earth
				108	balance of creating and consuming Earth's crust	65	identifying which geologic features on Earth were caused by meteors
				129	formation of Hawaiian Islands due to volcanic activity		
				132	volcanoes shape the Earth		
				136	constructive and destructive processes		
				136	constructive and destructive processes		
				137	constructive process of mountain building		
				138	the destructive process of erosion		
				139	wind erosion		
				139	formation of soil		
				150	the rock cycle		
				150	the rock cycle		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.8.A3 by end of grade 8	Earth Science	Earth's Properties and Materials	Recognize that fossils provide evidence about the plants and animals that lived long ago and nature of the environment at the time.	95	origin of fossils	49	determining the relative ages of rock formations
				96	relative dating	50	sequencing events in a geologic cross-section
				97	faunal succession		
				97	interpreting rock formations		
				143	studying moon rocks on Earth		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.8.B1 by end of grade 8	Earth Science	Atmosphere and Water	Describe conditions in the atmosphere that lead to weather systems and how these systems are represented on weather maps.	32	transfer of energy in and out of Earth's atmosphere	29	exploring how temperature-dependent layering creates currents
				45	convection currents in the atmosphere	33	finding relative humidity
				46	the Coriolis effect	35	use radar to detect a tornado
				47	global wind patterns	36	using radar to track a hurricane
				49	factors which influence the weather		
				49	water in the atmosphere affects weather patterns		
				50	phase changes in the atmosphere and dewpoint		
				51	cloud formation		
				53	forms of precipitation		
				54	cold fronts		
				54	effects of moving air masses		
				55	jet streams		
				55	warm fronts		
				56	rotation of air masses due to Coriolis effect		
				57	description of thunderstorms		
				58	description of hurricanes		
				59	description of tornadoes		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.8.C1 by end of grade 8	Earth Science	Processes that Shape the Earth	Explain how Earth's landforms and materials are created through constructive and destructive processes.	102	predicting what Earth might look like in 50 million years	52	listing which kind of plate boundary is associated with each geologic feature
				102	definition of plate tectonics	53	identifying tectonic plates and plate boundaries
				104	sea-floor spreading and mid-ocean ridges	54	predicting plate movement over 50 million years and the resultant land features
				105	magnetic patterns on the sea floor	60	understanding the Volcanic Explosivity Index
				106	theory of plate tectonics	61	examining the magma chemistry of volcanoes and how it relates to a volcano's location
				107	describing plate boundaries	61	finding a pattern of volcanoes related to the locations of plate boundaries
				107	activity of Earth's crust at plate boundaries	64	estimating the effects of meteor impacts on Earth
				108	divergent plate boundaries	65	identifying which geologic features on Earth were caused by meteors
				108	land features resulting from divergent plate boundaries		
				108	balance of creating and consuming Earth's crust		
				109	resulting land features from subduction		
				109	convergent plate boundaries		
				110	transform plate boundaries		
				110	land features resulting from transform plate boundaries		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
				111	earthquakes and plate tectonics		
				121	predict separation of North America and Europe in 75 million years		
				122	predict effects of divergent plate boundaries on Great Rift Valley		
				126	formation of magma in Earth's mantle		
				126	geologic basis for volcanic eruptions		
				127	where volcanic activity occurs		
				128	properties of volcanically formed rock		
				128	types and shapes of volcanoes		
				129	formation of Hawaiian Islands due to volcanic activity		
				129	geologic basis for shield volcanoes		
				129	formation of shield volcanoes due to hot spots		
				129	shield volcanoes		
				130	stratovolcanoes		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
				130	formation of stratovolcanoes due to subduction		
				130	geologic basis for stratovolcanoes		
				131	geologic bases for cinder cone volcanoes		
				132	volcanoes shape the Earth		
				133	types of volanic rock		
				135	describing volcanic rock		
				136	constructive and destructive processes		
				136	constructive and destructive processes		
				137	mountain-building		
				137	constructive process of mountain building		
				138	changes in land features due to erosion		
				138	the destructive process of erosion		
				138	landforms shaped by water		
				139	formation of soil		
				139	wind erosion		
				140	effect of glaciers on land		
				150	the rock cycle		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
				150	the rock cycle		
08.5.8.C2 by end of grade 8	Earth Science	Processes that Shape the Earth	Show how successive layers of sedimentary rock and the fossils contained in them can be used to confirm the age, history, changing life forms, and geology of Earth.	96 97 97 143	relative dating faunal succession interpreting rock formations studying moon rocks on Earth	49 50	determining the relative ages of rock formations sequencing events in a geologic cross-section
08.5.8.D1 by end of grade 8	Earth Science	How We Study the Earth	Utilize data gathered from emerging technologies (i.e. geographic information systems (GIS) and global positioning systems (GPS) to create representations and describe processes of change on the Earth's surface.			13 19 22 3 47 5 61	constructing a graph from atmospheric pressure data graphing water and ice temperature readings constructing a graph of time vs. temperature construct a graphical model constructing a graph of drops of acid vs pH construct a temperature vs. time graph plot locations of volcanoes using latitude and longitude

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.8.D2 by end of grade 8	Earth Science	How We Study the Earth	Explain how technology designed to investigate features of the Earth's surface impacts how scientists study the Earth.	3	thermometers	10	construct and use an aneroid barometer
				4	thermometers	2	accurately measuring temperature using thermometers
				26	measuring atmospheric pressure with barometers	34	using Doppler radar images to detect and track storms
				31	scientists detect loss of ozone in atmosphere		
				34	effects of global warming discovered		
				37	computer modeling to predict greenhouse effects		
				48	tracking ocean currents		
				49	sling psychrometer		
				63	trees and global climate		
				87	impact of carbon dioxide on life in the oceans		
				111	causes and descriptions of earthquakes		
				113	earthquakes rating scales		
				142	urban sprawl		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.9.A1 by end of grade 8	Astronomy and Space Science	Earth, Moon, Sun System	Investigate the Earth, moon, and sun as a system and explain how the motion of these bodies results in the phases of the moon and eclipses.	43	the effects of Earth's rotation on daytime heating and nighttime cooling	24	developing a hypothesis about why the seasons occur
				44	Earth's tilt causes seasons	26	investigating how the distance of Earth from the sun affects its intensity
				158	the lunar cycle	27	investigating how Earth's tilt affects the sun's intensity
				159	Earth's rotation and patterns of day and night	62	why studying the moon's surface is useful for understanding Earth
				161	axial tilt causes the seasons	72	building a sundial to keep track of daily time based on the cycles between Earth and the sun
				162	solar eclipses	74	modeling the lunar cycle
				162	lunar eclipses	75	constructing a lunar calendar
				163	solar eclipses	80	simulate an object in orbit and investigate how orbital period varies within distance
				163	solar eclipses	82	setting up a scale model of the solar system
				175	identify seasons	83	determining scale distances for the planets
				181	properties of the moon	84	determining scale sizes of the planets
				182	the moon as a satellite of Earth		
				183	the moon's effect on tides on Earth		
				184	the Earth-moon system		
				185	giant impact theory		
				186	orbits of planets around the sun		
				187	explanation and illustration of the solar system		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
				188	relative sizes and distances within the solar system		
				193	asteroids and comets		
				194	meteors and meteorites and the Kuiper Belt		
08.5.9.A2 by end of grade 8	Astronomy and Space Science	Earth, Moon, Sun System	Explain how the regular and predictable motions of the Earth and moon produce tides.	158	the lunar cycle	62	why studying the moon's surface is useful for understanding Earth
				162	lunar eclipses	74	modeling the lunar cycle
				163	solar eclipses	75	constructing a lunar calendar
				181	properties of the moon		
				182	the moon as a satellite of Earth		
				183	the moon's effect on tides on Earth		
				184	the Earth-moon system		
				185	giant impact theory		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.9.A3 by end of grade 8	Astronomy and Space Science	Earth, Moon, Sun System	Explain how the tilt, rotation, and orbital pattern of the Earth relative to the sun produce seasons and weather patterns.	43	the effects of Earth's rotation on daytime heating and nighttime cooling	24	developing a hypothesis about why the seasons occur
				44	Earth's tilt causes seasons	26	investigating how the distance of Earth from the sun affects its intensity
				159	Earth's rotation and patterns of day and night	27	investigating how Earth's tilt affects the sun's intensity
				161	axial tilt causes the seasons	72	building a sundial to keep track of daily time based on the cycles between Earth and the sun
				162	solar eclipses		
				163	solar eclipses		
				175	identify seasons		
08.5.9.B1 by end of grade 8	Astronomy and Space Science	Solar System	Describe the physical characteristics of the planets and other objects within the solar system and compare Earth to the rest of the planets.	24	comparison of Earth's atmosphere to other planets	80	simulate an object in orbit and investigate how orbital period varies within distance
				186	orbits of planets around the sun	82	setting up a scale model of the solar system
				187	explanation and illustration of the solar system	83	determining scale distances for the planets
				188	relative sizes and distances within the solar system	84	determining scale sizes of the planets
				189	what makes Earth capable of supporting life		
				193	asteroids and comets		
				194	meteors and meteorites and the Kuiper Belt		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
08.5.9.C1 by end of grade 8	Astronomy and Space Science	Stars	Understand that the sun is a star and that it shares characteristics with other stars.	196	descriptions of the sun and comparisons to other stars	79	observe and describe the appearance of the moon and Jupiter and its moons
				209	size of the sun compare to other stars		
				211	H-R diagrams comparing temperature and brightness of stars		
				212	the life cycle of stars		
				213	description and illustration of the life cycle of stars		
				214	elements formed by nuclear fusion in stars		
08.5.9.D1 by end of grade 8	Astronomy and Space Science	Galaxies and Universe	Know that the universe consists of many billions of galaxies, each including billions of stars.	165	characteristics of the universe		
				207	what is a star?		
				216	what is a galaxy?		
				217	the structure of the Milky Way Galaxy		
				226	research and describe astronomical objects		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.1.A1 by end of grade 12	Scientific Processes	Habits of Mind	When making decisions, evaluate conclusions, weigh evidence, and recognize that arguments may not have equal merit.	92	study claims made by bottled water companies	43	study water filtration device claims
				95	relative dating and modern geology based on Steno's theories		
				98	Kelvin's calculations of Earth's age		
				102	theory of plate tectonics		
				103	critiquing Wegener's theories of continental drift		
				137	Darwin's theories of the Andes formation		
				140	what causes ice ages		
				185	theories of origin of the moon		
				186	early theories of the solar system		
				221	Big Bang theory		

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Introduction to Earth and Space Science

Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.1.A2 by end of grade 12	Scientific Processes	Habits of Mind	Assess the risks and benefits associated with alternative solutions.	76	water cycle and conservation	17	research the causes of ozone in the lower atmosphere
				77	wise use of water	40	wise use of water supply
				79	water usage and quality	41	maintaining water supply quality
				80	effect of excess nitrates on environment	42	save water for houseplants
				81	acid rain explained	42	perform water quality tests
				92	research economic impact of producing gases that cause acid rain	44	investigate effect of acid rain on microorganisms
				92	research the issue of acid rain		
12.5.1.A3 by end of grade 12	Scientific Processes	Habits of Mind	Engage in collaboration, peer review, and accurate reporting of findings.			41	create water quality report
						43	write paragraph to explain results
						45	write summary of findings
12.5.1.A4 by end of grade 12	Scientific Processes	Habits of Mind	Explore cases that demonstrate the interdisciplinary nature of the scientific enterprise.	122	describe the work of a geologist and paleontologist and seismologist	40	water quality testing

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.1.B1 by end of grade 12	Scientific Processes	Inquiry and Problem Solving	Select and use appropriate instrumentation to design and conduct investigations.			10	design and construct an aneroid barometer
						2	measure temperature
						25	measuring the intensity of light using an electric meter and solar cell and light bulb
						76	identifying the parts of a refracting telescope and making observations of the moon's surface
12.5.1.B2 by end of grade 12	Scientific Processes	Inquiry and Problem Solving	Show that experimental results can lead to new questions and further investigations.			13	evaluating your aneroid barometer design
						17	predicting areas with high ozone concentration based on your data
						20	predicting what would happen if you place your ice/water test tube into a hot cup or a cold cup
						45	specifying how the daphnia experiment could be improved
						63	estimating the number of meteor collisions on Earth during the last 3.5 billion years
						66	predicting the results of the crystal-growing experiment

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.1.C1 by end of grade 12	Scientific Processes	Safety	Understand, evaluate and practice safe procedures for conducting science investigations.		featured throughout CPO Science program		data tables and graphs can be created using computer spreadsheets
				4	safety caution on heating jar	18	safety in greenhouse gas investigation
						2	thermometer safety
						26	safety using light bulbs
						32	safety in swinging thermometers
						4	heat safety
						42	safety tip for water testing
						44	safety tips for observing Daphnia
						8	heat safety
						80	safety in lab
						vi	safety in the laboratory

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.2.A1 by end of grade 12	Science and Society	Cultural Contributions	Recognize the role of the scientific community in responding to changing social and political conditions and how scientific and technological achievement affect historical events.	31	London Agreement of 1991	14	contributions of Schönbein
				35	hydrogen powered cars		
				35	should governments enforce changes for lowering greenhouse gas levels		
				73	governments managing water resources		
				77	the clean water act		
				83	catalytic converters and scrubbing reduce acid rain		
				92	is acid rain a problem in your community?		
				92	what is the history of your community's water supply and treatment		
				92	how is the government addressing the problem of acid rain?		
				112	what we can learn from seismographs		
				118	understanding earhquakes allows engineers to design safer buildings		
				157	history of calendars		
				159	counting the days in a year		

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
				160	the history of clocks and the division of time		
				163	ancient beliefs about solar eclipses		
				168	history of the telescope		
12.5.2.B1 by end of grade 12	Science and Society	Historical Perspectives	Examine the lives and contributions of important scientists who effected major breakthroughs in our understanding of the natural and designed world.	7	contributions of Joule		
				9	Joseph Black		
12.5.2.B2 by end of grade 12	Science and Society	Historical Perspectives	Discuss significant technological achievements in which science has played an important part as well as technological advances that have contributed directly to the advancement of scientific knowledge.	104	using echo sounders to map the sea floor		
				171	using satellite technology		
				173	space shuttle		

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.2.B3 by end of grade 12	Science and Society	Historical Perspectives	Describe the historical origin of important scientific developments such as atomic theory, plate testonics, ect., showing how scientific theories develop, are tested, and can be replaced or modified in light of new information and improved techniques.	20 92	research the history of heat and temperature research local water supply history		
12.5.3.B1 by end of grade 12	Mathematical Applications	Geometry and Measurement	When performing mathematical operations with measured quantities, express answers to reflect the degree of precision and accuracy of the print data.			2 44 46 5 73 77 9	collecting temperature data making detailed observations collecting pH readings while adding carbon dioxide collecting time and temperature data using your sundial to collect accurate data calibrating your telescope collecting and recording time and temperature data

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.3.C1 by end of grade 12	Mathematical Applications	Patterns and Algebra	Apply mathematical models that describe physical phenomena to predict real world events.	11	heat equation	13	constructing a graph from atmospheric pressure data
				219	inverse square law	17	predicting areas with high ozone concentration based on your data
						19	graphing water and ice temperature readings
						20	predicting what would happen if you place your ice/water test tube into a hot cup or a cold cup
						22	constructing a graph of time vs. temperature
						3	find equation for trend line
						3	construct a graphical model
						47	constructing a graph of drops of acid vs pH
						5	construct a temperature vs. time graph
						55	evaluating your completed bathymetric map
						63	estimating the number of meteor collisions on Earth during the last 3.5 billion years
						66	predicting the results of the crystal-growing experiment

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
						71	evaluate your ability to interpret rock formations
						81	inverse square law
12.5.3.D1 by end of grade 12	Mathematical Applications	Data Analysis and Probability	Construct and interpret graphs of data to represent inverse and non-linear relationships, and statistical distributions.			13	graphing and drawing a trend line for atmospheric pressure data
						13	constructing a graph from atmospheric pressure data
						19	graphing water and ice temperature readings
						22	constructing a graph of time vs. temperature
						3	find slope of a trend line
						3	draw a line of best fit through temperature data points
						3	construct a graphical model
						47	constructing a graph of drops of acid vs pH
						5	calculate slope of a graph
						5	construct a temperature vs. time graph

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.4.A1 by end of grade 12	Nature and Process of Technology	Science and Technology	Know that scientific inquiry is driven by the desire to understand the natural world and seeks to answer questions that may or may not directly influence humans, while technology is driven by the need to meet human needs and solve human problems.	15	convection and sea breezes	13	evaluating the relationship between atmospheric pressure and weather
				25	why do ears pop	31	the food paradox of the oceans
				35	hydrogen powered cars		
				41	patterns of heating and cooling on Earth		
				56	meteorologists use atmospheric pressure data to understand movement of weather systems		
				60	patterns in storm activity across the globe		
				77	the clean water act		
				83	catalytic converters and scrubbing reduce acid rain		
				104	using echo sounders to map the sea floor		
				107	patterns of earthquakes and volcanoes		
				112	what we can learn from seismographs		
				114	boundaries of tectonic plates		
				118	understanding earhquakes allows engineers to design safer buildings		
				127	the Ring of Fire		

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
				158	lunar cycles		
				171	using satellite technology		
				173	space shuttle		
				183	tides		
				211	categorizing stars with H-R diagrams		
				222	evidence for Big Bang theory		
12.5.4.B1 by end of grade 12	Nature and Process of Technology	Nature of Technology	Assess the impacts of introducing a new technology in terms of alternative solutions, costs, tradeoffs, risks, benefits and environmental impact.	76	water cycle and conservation	17	research the causes of ozone in the lower atmosphere
				77	wise use of water	40	wise use of water supply
				79	water usage and quality	41	maintaining water supply quality
				80	effect of excess nitrates on environment	42	save water for houseplants
				81	acid rain explained	42	perform water quality tests
				92	research economic impact of producing gases that cause acid rain	44	investigate effect of acid rain on microorganisms
				92	research the issue of acid rain		

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.4.C1 by end of grade 12	Nature and Process of Technology	Technological Design	Plan, develop, and implement a proposal to solve an authentic technological problem.			10 10 38 38 56 56 70 70 73 73	build your own atmospheric pressure gauge design and construct an aneroid barometer design a scale model of a zoo desisgn a scale model of a zoo simulate an earthquake simulate an earthquake design a metamorphism simulation design a metamorphism simulation design a sundial design a sundial
12.5.8.A1 by end of grade 12	Earth Science	Earth's Properties and Materials	Explain the interrelationship of the geosphere, hydrosphere, and the atmosphere.	23 24 29 30 84	description of Earth’s atmosphere effect of life on Earth’s atmosphere layers of the atmosphere layers of the atmosphere oceans as part of the hydrosphere		

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.8.B1 by end of grade 12	Earth Science	Atmosphere and Water	Describe how weather (in the short term) and climate (in the long term) involve the transfer of energy in and out of the atmosphere.	32	transfer of energy in and out of Earth's atmosphere		

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.8.C1 by end of grade 12	Earth Science	Processes that Shape the Earth	Use the theory of plate tectonics to explain the relationship among earthquakes, volcanoes, mid-ocean ridges, and deep-sea trenches.	102	definition of plate tectonics	52	listing which kind of plate boundary is associated with each geologic feature
				102	predicting what Earth might look like in 50 million years	53	identifying tectonic plates and plate boundaries
				104	sea-floor spreading and mid-ocean ridges	54	predicting plate movement over 50 million years and the resultant land features
				105	magnetic patterns on the sea floor	60	understanding the Volcanic Explosivity Index
				106	theory of plate tectonics	61	examining the magma chemistry of volcanoes and how it relates to a volcano's location
				107	describing plate boundaries	61	finding a pattern of volcanoes related to the locations of plate boundaries
				108	land features resulting from divergent plate boundaries	64	estimating the effects of meteor impacts on Earth
				108	divergent plate boundaries	65	identifying which geologic features on Earth were caused by meteors
				109	resulting land features from subduction		
				109	convergent plate boundaries		
				110	land features resulting from transform plate boundaries		
				110	transform plate boundaries		
				111	earthquakes and plate tectonics		
				111	causes and descriptions of earthquakes		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
				113	earthquakes rating scales		
				121	predict separation of North America and Europe in 75 million years		
				122	predict effects of divergent plate boundaries on Great Rift Valley		
				125	structure of a volcano		
				126	formation of magma in Earth's mantle		
				126	geologic basis for volcanic eruptions		
				127	where volcanic activity occurs		
				128	properties of volcanically formed rock		
				128	figure showing structure of different types of volcanoes		
				128	types and shapes of volcanoes		
				129	shield volcanoes		
				129	formation of shield volcanoes due to hot spots		
				129	geologic basis for shield volcanoes		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
				129	formation of Hawaiian Islands due to volcanic activity		
				130	formation of stratovolcanoes due to subduction		
				130	stratovolcanoes		
				130	geologic basis for stratovolcanoes		
				131	geologic bases for cinder cone volcanoes		
				132	volcanoes shape the Earth		
				133	types of volanic rock		
				135	describing volcanic rock		
				137	constructive process of mountain building		
				137	mountain-building		
				138	changes in land features due to erosion		
				138	the destructive process of erosion		
				139	wind erosion		
				140	effect of glaciers on land		

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.8.C2 by end of grade 12	Earth Science	Processes that Shape the Earth	Know that Earth is a system in which chemical elements exist in fixed amounts and move through the solid Earth, oceans, atmosphere, and living things as part of geochemical cycles.	23	nitrogen cycle	28	investigate how the ocean 's salinity affects its density
				81	effects of acid rain on natural environments	40	actions to take to improve water quality
				84	oceans in the water cycle		
				85	sources of salts in the ocean		
				86	composition of seawater		
				107	activity of Earth's crust at plate boundaries		
				108	balance of creating and consuming Earth's crust		
				133	volcanoes and water vapor		
				136	constructive and destructive processes		
				138	landforms shaped by water		
				150	the rock cycle		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.8.C3 by end of grade 12	Earth Science	Processes that Shape the Earth	Recognize that the evolution of life on Earth has changed the composition of Earth's atmosphere through time.	31	effects of CFC's on the ozone layer	18	investigate the temperature effects of greenhouse gases
				33	greenhouse conditions on Earth	40	predict the quality of surface water to be tested and justify your answer
				33	greenhouse effect and greenhouse gasses	44	the effects of acid rain on organisms in aquatic environments
				33	global warming	47	effect of ocean on carbon dioxide levels in the atmosphere
				34	changes to the oceans due to increasing global temperatures		
				34	effects of burning fossil fuels		
				35	global temperature changing over time		
				37	research the density of Venus' and Mars' atmospheres		
				56	temperature inversion		
				67	permafrost		
				81	acid rain		
				82	causes and health effects of acid rain		
				83	illustration of acid rain formation		
				87	impact of increased CO2 on oceans		
				87	impact of increased CO2 in oceans		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
				102	Earth's surface is changing		
				142	how urban sprawl changes local climate		
				189	greenhouse conditions on Venus		

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.8.D1 by end of grade 12	Earth Science	How We Study the Earth	Analyze the evidence produced by a variety of techniques that is used to understand changes in the Earth that have occurred over time (topography, fossils, rock stratification, ice cores, and radiometric data).	96	relative dating	49	determining the relative ages of rock formations
				97	interpreting rock formations	50	sequencing events in a geologic cross-section
				97	faunal succession	52	reading a bathymetric map
				102	predicting what Earth might look like in 50 million years	53	using a geologic hazard map of frequent earthquakes
				108	land features resulting from divergent plate boundaries	54	predicting plate movement over 50 million years and the resultant land features
				109	resulting land features from subduction	64	estimating the effects of meteor impacts on Earth
				110	land features resulting from transform plate boundaries	65	identifying which geologic features on Earth were caused by meteors
				114	where earthquakes occur		
				115	earthquake hazard map		
				121	predict separation of North America and Europe in 75 million years		
				122	predict effects of divergent plate boundaries on Great Rift Valley		
				129	formation of Hawaiian Islands due to volcanic activity		
				132	volcanoes shape the Earth		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
				137	constructive process of mountain building		
				137	mountain-building		
				138	changes in land features due to erosion		
				138	the destructive process of erosion		
				139	wind erosion		
				140	effect of glaciers on land		
				141	geologic hazard maps		
				143	studying moon rocks on Earth		
				154	using a geologic hazard map		

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Student Text and Investigation Manual

Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.9.A1 by end of grade 12	Astronomy and Space Science	Earth, Moon, Sun System	Explain how the motions of the Earth, sun and moon, define units of time including: days,month, and years.	43	the effects of Earth's rotation on daytime heating and nighttime cooling	24	developing a hypothesis about why the seasons occur
				44	Earth's tilt causes seasons	26	investigating how the distance of Earth from the sun affects its intensity
				158	the lunar cycle	27	investigating how Earth's tilt affects the sun's intensity
				159	Earth's rotation and patterns of day and night	62	why studying the moon's surface is useful for understanding Earth
				161	axial tilt causes the seasons	72	building a sundial to keep track of daily time based on the cycles between Earth and the sun
				162	lunar eclipses	74	modeling the lunar cycle
				162	solar eclipses	75	constructing a lunar calendar
				163	solar eclipses		
				163	solar eclipses		
				175	identify seasons		
				181	properties of the moon		
				182	the moon as a satellite of Earth		
				183	the moon's effect on tides on Earth		
				184	the Earth-moon system		
				185	giant impact theory		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.9.A2 by end of grade 12	Astronomy and Space Science	Earth, Moon, Sun System	Recognize that changes in the Earth's position relative to the sun produces differing amounts of daylight seasonally.	43	the effects of Earth's rotation on daytime heating and nighttime cooling	24	developing a hypothesis about why the seasons occur
				44	Earth's tilt causes seasons	26	investigating how the distance of Earth from the sun affects its intensity
				159	Earth's rotation and patterns of day and night	27	investigating how Earth's tilt affects the sun's intensity
				161	axial tilt causes the seasons	72	building a sundial to keep track of daily time based on the cycles between Earth and the sun
				162	solar eclipses		
				163	solar eclipses		
				175	identify seasons		
12.5.9.B1 by end of grade 12	Astronomy and Space Science	Solar System	Explain that our solar system coalesced from a nebular cloud of gas and dust left from exploding stars.	215	how the solar system was formed		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.9.C1 by end of grade 12	Astronomy and Space Science	Stars	Describe the physical characteristics, stages of development, and the apparent motions of stars.	212	the life cycle of stars	79	observe and describe the appearance of the moon and Jupiter and its moons
				213	death of small to medium stars results in white dwarfs and planetary nebula and black dwarfs	88	using spectroscopy to analyze the light emitted by stars and identify most common elements
				213	description and illustration of the life cycle of stars		
				214	death of massive stars results in supernovas and neutron stars and black holes		
				214	elements formed by nuclear fusion in stars		
12.5.9.D1 by end of grade 12	Astronomy and Space Science	Galaxies and Universe	Describe data gathering and observation technologies and explain how they are used to explore the solar system and beyond.	168	history of the telescope	88	understand why spectroscopy is an important tool of astronomers
				169	types and uses of telescopes	92	measuring apparent brightness to calculate the distance to stars and galaxies
				170	types and uses of telescopes		
				171	satellites as tools of astronomy		
				172	spacecraft as tools of astronomy		
				208	the use of spectroscopy to analyze stars		

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Standard #: Grade level	Standard	Strand	Cumulative Progress	student text pg	detail	investigation pg	detail
12.5.9.D2 by end of grade 12	Astronomy and Space Science	Galaxies and Universe	Cite evidence to describe the scientific theory of the origin of the universe and the current explanations of its evolution.	185	historical theories of the origin of the moon		
				186	historical theories about the solar system		
				195	historical theories of which objects were planets		
				221	the Big Bang theory of the origin of the universe		
				222	evidence for the Big Bang theory		
				223	evidence for the Big Bang theory		