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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
4a.ESEarth Grade 8 Physical Science	Earth in the Solar System (Earth Science)	The structure and composition of the universe can be learned from the study of stars and galaxies, and their evolution.	Galaxies are clusters of billions of stars, and may have different shapes.	165 207 216 226	characteristics of the universe what is a star? what is a galaxy? research and describe astronomical objects		
4b.ESEarth Grade 8 Physical Science	Earth in the Solar System (Earth Science)	The structure and composition of the universe can be learned from the study of stars and galaxies, and their evolution.	The sun is one of many stars in our own Milky Way galaxy. Stars may differ in size, temperature, and color.	217 217	the structure of the Milky Way Galaxy the structure of the Milky Way Galaxy		
4c.ESEarth Grade 8 Physical Science	Earth in the Solar System (Earth Science)	The structure and composition of the universe can be learned from the study of stars and galaxies, and their evolution.	How to use astronomical units and light years as measures of distance between the sun, stars, and Earth.	166 167	calculating and using light years light years and time	92	calculating the distance to stars and galaxies using apparent brightness and absolute brightness

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4d.ESEarth Grade 8 Physical Science	Earth in the Solar System (Earth Science)	The structure and composition of the universe can be learned from the study of stars and galaxies, and their evolution.	Stars are the source of light for all bright objects in outer space. The moon and planets shine by reflected sunlight, not by their own light.	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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4e.ESEarth Grade 8 Physical Science	Earth in the Solar System (Earth Science)	The structure and composition of the universe can be learned from the study of stars and galaxies, and their evolution.	The appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.	97 186 187 188 193 194	faunal succession orbits of planets around the sun explanation and illustration of the solar system relative sizes and distances within the solar system asteroids and comets meteors and meteorites and the Kuiper Belt	80 82 83 84	simulate an object in orbit and investigate how orbital period varies within distance setting up a scale model of the solar system determining scale distances for the planets determining scale sizes of the planets
9a.Gen Grade 8 Physical Science	Investigation and Experimentation	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform invest	Plan and conduct a scientific investigation to test a hypothesis.	92	describe steps you would take to determine how pH affects frog population	21 4 44 57 61 9	investigating how specific heat of water regulates Earth's temperature conducting investigation of efficiency of immersion heater simulating the effect of acid rain on daphnia identifying how the earthquake model represents an earthquake develop a research plan for studying volcanoes conducting experiments on heat transfer

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
9b.Gen Grade 8 Physical Science	Investigation and Experimentation	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform invest	Evaluate the accuracy and reproducibility of data.	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 13 15 19 2 22 24 3 44 46 47 5	constructing a graph from atmospheric pressure data calculating error between your barometer and a commercial barometer importance of good record keeping in order to avoid error graphing water and ice temperature readings collecting temperature data constructing a graph of time vs. temperature testing hypothesis of why seasons occur against your observations in the investigation construct a graphical model making detailed observations collecting pH readings while adding carbon dioxide constructing a graph of drops of acid vs pH construct a temperature vs. time graph

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
						5	collecting time and temperature data
						55	evaluating your completed bathymetric map
						71	evaluate your ability to interpret rock formations
						73	using your sundial to collect accurate data
						77	calibrating your telescope
						9	collecting and recording time and temperature data
9c.Gen Grade 8 Physical Science	Investigation and Experimentation	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform invest	Distinguish between variable and controlled parameters in a test.	92	describe steps you would take to determine how pH affects frog population	24	testing hypothesis of why seasons occur against your observations in the investigation
						27	determining whether distance from light source or axial tilt plays a more significant role in causing the seasons
						6	effect of changing mass on collected data
						61	develop a research plan for studying volcanoes

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9d.Gen Grade 8 Physical Science	Investigation and Experimentation	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform invest	Recognize the slope of the linear graph as the constant in the relationship y=kx and apply this to interpret graphs constructed from data.			13 19 22 3 3 47 5 5	constructing a graph from atmospheric pressure data graphing water and ice temperature readings constructing a graph of time vs. temperature find slope of a trend line construct a graphical model constructing a graph of drops of acid vs pH calculate slope of a graph construct a temperature vs. time graph

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
9e.Gen Grade 8 Physical Science	Investigation and Experimentation	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform invest	Construct appropriate graphs from data and develop quantitative statements about the relationship between variables.	11 219	heat equation inverse square law	13 19 22 3 3 47 5 81	constructing a graph from atmospheric pressure data graphing water and ice temperature readings constructing a graph of time vs. temperature find equation for trend line construct a graphical model constructing a graph of drops of acid vs pH construct a temperature vs. time graph inverse square law
9f.Gen Grade 8 Physical Science	Investigation and Experimentation	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform invest	Apply simple mathematical relationships to determine one quantity given the other two (including speed = distance/time, density = mass/volume, force = pressure x area, volume = area x height).	11 219	heat equation inverse square law	3 81	find equation for trend line inverse square law

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
9g.Gen Grade 8 Physical Science	Investigation and Experimentation	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform invest	Distinguish between linear and non-linear relationships on a graph of data.	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	3 5 95	find slope of a trend line calculate slope of a graph calculating solar brightness units (SBU) from kilometers in scientific notation

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
ESHS.01.a Earth Science	Earth's Place in the Universe	Astronomy and planetary exploration reveal the solar system's structure, scale, and change over time.	Students know how the difference and similarities among the sun, the terrestrial planets, and the gas planets may have been established during the formation of the solar system.	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		
				215	the existence of other planetary systems		
				215	how the solar system was formed		
ESHS.01.b Earth Science	Earth's Place in the Universe	Astronomy and planetary exploration reveal the solar system's structure, scale, and change over time.	Students know the evidence from Earth and moon rocks indicates that the solar system was formed from a nebular cloud of dust and gas approximately 4.6 billion years ago.	215	how the solar system was formed		

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
ESHS.01.c Earth Science	Earth's Place in the Universe	Astronomy and planetary exploration reveal the solar system's structure, scale, and change over time.	Students know the evidence from geological studies of Earth and other planets suggest that the early Earth was very different from Earth today	33	global warming	49	determining the relative ages of rock formations
				35	global temperature changing over time	50	sequencing events in a geologic cross-section
				96	relative dating	52	reading a bathymetric map
				97	interpreting rock formations	53	using a geologic hazard map of frequent earthquakes
				102	Earth's surface is changing	54	predicting plate movement over 50 million years and the resultant land features
				102	predicting what Earth might look like in 50 million years	64	estimating the effects of meteor impacts on Earth
				108	land features resulting from divergent plate boundaries	65	identifying which geologic features on Earth were caused by meteors
				109	resulting land features from subduction		
				110	land features resulting from transform plate boundaries		
				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		

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				129	formation of Hawaiian Islands due to volcanic activity		
				132	volcanoes shape the Earth		
				137	mountain-building		
				137	constructive process of 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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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
ESHS.01.d Earth Science	Earth's Place in the Universe	Astronomy and planetary exploration reveal the solar system's structure, scale, and change over time.	Students know the evidence indicating that the planets are much closer to Earth than the stars are.	165	characteristics of the universe	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
				207	what is a star?		
				216	what is a galaxy?		
				226	research and describe astronomical objects		
ESHS.01.e Earth Science	Earth's Place in the Universe	Astronomy and planetary exploration reveal the solar system's structure, scale, and change over time.	Students know the sun is a typical star and is powered by nuclear reactions, primarily the fusion of hydrogen to form helium.	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	88	light emission and chemical composition
				214	death of massive stars results in supernovas and neutron stars and black holes	91	spectral lines and elements
				214	death of massive stars		
				214	birth of elements		
				214	elements formed by nuclear fusion in stars		

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
ESHS.01.f Earth Science	Earth's Place in the Universe	Astronomy and planetary exploration reveal the solar system's structure, scale, and change over time.	students know the evidence for the dramatic effects that asteroid impacts have had in shaping the surface of planets and their moons and in mass extinctions of life on Earth.	96	relative dating	49	determining the relative ages of rock formations
				97	interpreting rock formations	50	sequencing events in a geologic cross-section
				98	extinction of the dinosaurs due to giant meteor hitting Earth		
				143	studying moon rocks on Earth		
				193	how an asteroid event may have caused the extinction of dinosaurs		
ESHS.01.g Earth Science	Earth's Place in the Universe	Astronomy and planetary exploration reveal the solar system's structure, scale, and change over time.	Students know the evidence for the existence of planets orbiting other stars.	215	the existence of other planetary systems		
ESHS.02.a Earth Science	Earth's Place in the Universe	Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time.	Students know the solar system is located in an outer edge of the disc-shaped Milky Way galaxy, which spans 100,000 light years.	186	orbits of planets around the sun	80	simulate an object in orbit and investigate how orbital period varies within distance
				193	asteroids and comets		
				194	meteors and meteorites and the Kuiper Belt		

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
ESHS.02.b Earth Science	Earth's Place in the Universe	Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time.	Students know galaxies are made of billions of stars and comprise most of the visible mass of the universe.	189 198 199	classifying the planets features and diagram of the sun features and emissions of the sun		
ESHS.02.c Earth Science	Earth's Place in the Universe	Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time.	Students know the evidence indicating that all elements with an atomic number greater then that of lithium have been formed by nuclear fusion stars.	214 214	death of massive stars birth of elements	88 91	light emission and chemical composition spectral lines and elements
ESHS.02.d Earth Science	Earth's Place in the Universe	Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time.	Students know that stars differ in their life cycles and that visual, radio, and X-ray telescopes may be used to collect data reveal those differences.	168 169 170 171 172 208	history of the telescope types and uses of telescopes types and uses of telescopes satellites as tools of astronomy spacecraft as tools of astronomy the use of spectroscopy to analyze stars	88 92	understand why spectroscopy is an important tool of astronomers measuring apparent brightness to calculate the distance to stars and galaxies

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
ESHS.02.e Earth Science	Earth's Place in the Universe	Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time.	Students know accelerators boost subatomic particles to energy levels that simulate conditions in the stars and in the early history of the universe before stars formed.	168 169 170 171 172 208	history of the telescope types and uses of telescopes types and uses of telescopes satellites as tools of astronomy spacecraft as tools of astronomy the use of spectroscopy to analyze stars	88 92	understand why spectroscopy is an important tool of astronomers measuring apparent brightness to calculate the distance to stars and galaxies
ESHS.02.f Earth Science	Earth's Place in the Universe	Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time.	Students know the evidence indicating that the color, brightness, and evolution of a star are determined by a balance between gravitational collapse and nuclear fusion.	213 214	death of small to medium stars results in white dwarfs and planetary nebula and black dwarfs death of massive stars results in supernovas and neutron stars and black holes	88	using spectroscopy to analyze the light emitted by stars and identify most common elements

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ESHS.02.g Earth Science	Earth's Place in the Universe	Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time.	Students know how the red-shift from distant galaxies and the cosmic background radiation provide evidence for the "big bang" model that suggests that the universe has been expanding for 10 to 20 billion years.	222 223	evidence for the Big Bang theory evidence for the Big Bang theory		
ESHS.03.a Earth Science	Dynamic Earth Processes	Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface.	Students know features of the ocean floor (magnetic patterns, age, and sea-floor topography) provide evidence of plate tectonics.	104 105	sea-floor spreading and mid-ocean ridges magnetic patterns on the sea floor	52	listing which kind of plate boundary is associated with each geologic feature
ESHS.03.b Earth Science	Dynamic Earth Processes	Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface.	Students know the principal structures that form at the three different kinds of plate boundaries.	107 108 109 110	describing plate boundaries divergent plate boundaries convergent plate boundaries transform plate boundaries	53	identifying tectonic plates and plate boundaries

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ESHS.03.c Earth Science	Dynamic Earth Processes	Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface.	Students know how to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes.	128 133 135	properties of volcanically formed rock types of volanic rock describing volcanic rock	61	examining the magma chemistry of volcanoes and how it relates to a volcano's location
ESHS.03.d Earth Science	Dynamic Earth Processes	Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface.	Students know why and how earthquakes occur and the scales used to measure their intensity and magnitude.	111 113	causes and descriptions of earthquakes earthquakes rating scales		
ESHS.03.e Earth Science	Dynamic Earth Processes	Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface.	Students know there are two kinds of volcanoes: one kind with violent eruptions producing steep slopes and the other kind with voluminous lava flows producing gentle slopes.	128 129 130	types and shapes of volcanoes shield volcanoes stratovolcanoes	60	understanding the Volcanic Explosivity Index

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ESHS.03.f Earth Science	Dynamic Earth Processes	Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface.	Students know the explanation for the location and properties of volcanoes that are due to hot spots and the explanation for those that are due to subduction.	129 130	formation of shield volcanoes due to hot spots formation of stratovolcanoes due to subduction	61	finding a pattern of volcanoes related to the locations of plate boundaries
ESHS.04.a Earth Science	Energy in the Earth System	Energy enters the Earth system primarily as solar radiation and eventually escapes as heat.	Students know the relative amount of incoming solar energy compared with Earth's internal energy and the energy used by society.	37	Earth’s internal energy		
ESHS.04.b Earth Science	Energy in the Earth System	Energy enters the Earth system primarily as solar radiation and eventually escapes as heat.	Students know the fate of incoming solar radiation in terms of reflection, absorption, and photosynthesis.	32 33	distribution of incoming solar radiation Earth’s "energy budget"		
ESHS.04.c Earth Science	Energy in the Earth System	Energy enters the Earth system primarily as solar radiation and eventually escapes as heat.	Students know the different atmospheric gases that absorb the Earth's thermal radiation and the mechanism and significance of the greenhouse effect.	33	greenhouse effect and greenhouse gasses	18 47	investigate the temperature effects of greenhouse gases effect of ocean on carbon dioxide levels in the atmosphere

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
ESHS.04.d Earth Science	Energy in the Earth System	Energy enters the Earth system primarily as solar radiation and eventually escapes as heat.	Students know the differing greenhouse conditions on Earth, Mars, and Venus; the origins of those conditions; and the climatic consequences of each.	33 37 189	greenhouse conditions on Earth research the density of Venus' and Mars' atmospheres greenhouse conditions on Venus		
ESHS.05.a Earth 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.	Students know how differential heating of Earth results in circulation patterns in the atmosphere and oceans that globally distribute the heat.	45	convection currents in the atmosphere	29	exploring how temperature-dependent layering creates currents
ESHS.05.b Earth 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.	Students know the relationship between the rotation of Earth and the circular motions of ocean currents and air in pressure centers.	46 56	the Coriolis effect rotation of air masses due to Coriolis effect		

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
ESHS.05.c Earth 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.	Students know the origin and effects of temperature inversions.	48	descriptions of ocean currents and their effects on climate	23	research how large bodies of water affect climate
				56	temperature inversion	31	understanding the Atlantic gyre
				81	acid rain	44	the effects of acid rain on organisms in aquatic environments
				82	causes and health effects of acid rain		
				87	impact of increased CO2 on oceans		
ESHS.05.d Earth 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.	Students know properties of ocean water, such as temperature and salinity, can be used to explain the layered structure of the oceans, the generation of horizontal and vertical ocean currents, and the geographic of distribution of marine organisms.	60	causes and effects of the El Nino Southern Oscillation	28	investigate how the ocean 's salinity affects its density
				85	sources of salts in the ocean		
				86	composition of seawater		

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
ESHS.05.e Earth 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.	Students know rain forests and deserts on Earth are distributed in bands at specific latitudes.	61 63	descriptions and distribution of desert biomes descriptions and distribution of tropical rainforest biomes		
ESHS.05.f Earth 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.	students know the interaction of wind patterns, ocean currents, and mountain ranges results in the global pattern of latitudinal bands of rain forests and deserts.	62 63	different types of deserts and how they are formed how tropical rainforests are formed	39	research a particular biome
ESHS.05.g Earth 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.	Students know features of the ENSO (El Nino southern oscillation) cycle in terms of sea-surface and air temperature variations across the Pacific and some climatic results of this cycle.	60	causes and effects of the El Nino Southern Oscillation		

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ESHS.06.a Earth Science	Energy in the Earth System	Climate is the long-term average of a region's weather and depends on many factors.	Students know weather (in the short run) and climate (in the long run) involve the transfer of energy into and out of the atmosphere.	32	transfer of energy in and out of Earth's atmosphere		
ESHS.06.b Earth Science	Energy in the Earth System	Climate is the long-term average of a region's weather and depends on many factors.	Students know the effects on climate of latitude, elevation, topography, and proximity to large bodies of water and cold or warm ocean currents.	43 48 62 63 65 67	Earth's temperature varies with latitude effects of the Gulf Stream on climate of Great Britain effect of cold ocean currents on formation of fog desserts effect of warm ocean currents on formation of tropical rainforest effect of large bodies of water on climate alpine tundra occurs at high altitudes	23	research how large bodies of water affect climate

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
ESHS.06.c Earth Science	Energy in the Earth System	Climate is the long-term average of a region's weather and depends on many factors.	Students know how Earth's climate has changed over time, corresponding to changes in Earth's geography, atmospheric composition, and other factors, such as solar radiation and plate movement.	35 102	global temperature changing over time Earth's surface is changing		
ESHS.06.d Earth Science	Energy in the Earth System	Climate is the long-term average of a region's weather and depends on many factors.	Students know how computer models are used to predict the effects of the increase in greenhouse gases on climate for the planet as a whole and for specific regions.	37	computer modeling to predict greenhouse effects		
ESHS.07.a Earth Science	Biogeochemical Cycles	Each element on Earth moves among reservoirs, which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles.	Students know the carbon cycle of photosynthesis and respiration and the nitrogen cycle.	23 81	nitrogen cycle effects of acid rain on natural environments	40	actions to take to improve water quality

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ESHS.07.b Earth Science	Biogeochemical Cycles	Each element on Earth moves among reservoirs, which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles.	Students know the global carbon cycle: the different physical and chemical forms of carbon in the atmosphere, oceans, biomass, fossil fuels, and the movement of carbon among these reservoirs.	23 31 34 67 81 87	nitrogen cycle effects of CFC's on the ozone layer effects of burning fossil fuels permafrost effects of acid rain on natural environments impact of increased CO2 in oceans	40 40	predict the quality of surface water to be tested and justify your answer actions to take to improve water quality
ESHS.07.c Earth Science	Biogeochemical Cycles	Each element on Earth moves among reservoirs, which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles.	Students know the movement of matter among reservoirs is driven by Earth's internal and external sources of energy.	37	Earth's internal energy		
ESHS.07.d Earth Science	Biogeochemical Cycles	Each element on Earth moves among reservoirs, which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles.	Students know the relative residence times and flow characteristics of carbon in and out of its different reservoirs.	31 34 67 87	effects of CFC's on the ozone layer effects of burning fossil fuels permafrost impact of increased CO2 in oceans	40	predict the quality of surface water to be tested and justify your answer

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ESHS.08.a Earth Science	Structure and Composition of the Atmosphere	Life has changed Earth's atmosphere, and changes in the atmosphere affect conditions for life.	Students know the thermal structure and chemical composition of the atmosphere.	23	composition of Earth's atmosphere	14	detecting ozone which is a protective atmosphere gas against high energy radiation
				25	definition of atmospheric pressure		
				27	how atmospheric pressure changes with altitude		
				28	graph showing atmospheric pressure vs. altitude		
ESHS.08.b Earth Science	Structure and Composition of the Atmosphere	Life has changed Earth's atmosphere, and changes in the atmosphere affect conditions for life.	Students know how the composition of Earth's atmosphere has evolved over geologic time and know the effect of outgassing, the variations of carbon dioxide concentration, and the origin of atmospheric oxygen.	35	global temperature changing over time		
				102	Earth's surface is changing		

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ESHS.08.c Earth Science	Structure and Composition of the Atmosphere	Life has changed Earth's atmosphere, and changes in the atmosphere affect conditions for life.	Students know the location of the ozone layer in the upper atmosphere, its role in absorbing ultraviolet radiation, and the way in which this layer varies both naturally and in response to human activities.		featured in ancillary component	18	investigate the temperature effects of greenhouse gases
				33	greenhouse effect and greenhouse gasses	47	effect of ocean on carbon dioxide levels in the atmosphere
ESHS.09.a Earth Science	California Geology	The geology of California underlies the state's wealth of natural resources as well as its natural hazards.	Students know the resources of major economic importance in California and their relation to California's geology.		featured in ancillary component		
				116	using seismic waves for oil and gas exploration		
				134	mineral deposits and diamonds		

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ESHS.09.b Earth Science	California Geology	The geology of California underlies the state's wealth of natural resources as well as its natural hazards.	Students know the principal natural hazards in different California regions and the geologic basis of those hazards.		featured in ancillary component		
				111	earthquakes and plate tectonics		
				126	geologic basis for volcanic eruptions		
				126	formation of magma in Earth's mantle		
				127	where volcanic activity occurs		
				129	geologic basis for shield volcanoes		
				130	geologic basis for stratovolcanoes		
				131	geologic bases for cinder cone volcanoes		
ESHS.09.c Earth Science	California Geology	The geology of California underlies the state's wealth of natural resources as well as its natural hazards.	Students know the importance of water to society, the origins of California's fresh water, and the relationship between supply and need.		featured in ancillary component		
				107	activity of Earth's crust at plate boundaries		
				108	balance of creating and consuming Earth's crust		
				136	constructive and destructive processes		
				150	the rock cycle		

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ESHS.09.d Earth Science	California Geology	The geology of California underlies the state's wealth of natural resources as well as its natural hazards.	Students know how to analyze published geologic hazard maps of California and know how to use the map's information to identify evidence of geologic events of the past and predict geologic changes in the future.		featured in ancillary component	52	reading a bathymetric map
				114	where earthquakes occur	53	using a geologic hazard map of frequent earthquakes
				115	earthquake hazard map		
				141	geologic hazard maps		
				154	using a geologic hazard map		

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
InqHS.01.a Investigation and Experimentation	Standard	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop questions and perform investigations.	Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.	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
				226	analysis with a spectrometer (#4)	22	collecting temperature and time data
						26	collecting qualitative data of light intensity at scale distance from the sun
						33	collecting wet and dry bulb temperature readings
						44	making detailed observations
						44	observing daphnia and recording movements and behavior
						46	collecting pH readings while adding carbon dioxide
						5	collecting time and temperature data
						73	using your sundial to collect accurate data
						77	calibrating your telescope
						9	collecting and recording time and temperature data

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InqHS.01.b Investigation and Experimentation	Standard	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop questions and perform investigations.	Identify and communicate sources of unavoidable experimental error.	37	what percentage comes from this source? (problem 4)	13	calculating error between your barometer and a commercial barometer
				117	determining distance to an epicenter	15	importance of good record keeping in order to avoid error
				121	what explains the difference in density? (#5)	2	collecting temperature data
				179	how big is Earth?	44	making detailed observations
						46	collecting pH readings while adding carbon dioxide
						5	collecting time and temperature data
						73	using your sundial to collect accurate data
						77	calibrating your telescope
						9	collecting and recording time and temperature data

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InqHS.01.c Investigation and Experimentation	Standard	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop questions and perform investigations.	Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.	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

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
InqHS.01.d Investigation and Experimentation	Standard	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop questions and perform investigations.	Formulate explanations by using logic and evidence.	8	determining effect of changing mass on temperature changes	13	identifying relationships between air pressure and weather
				12	thermal equilibrium	13	evaluating your aneroid barometer design
				49	factors that shape the weather	22	identifying relationship between percent of Earth covered in water and temperature range
				82	what causes acid rain	44	making hypotheses and testing them against observations
				182	relationship between orbital speed and distance between two objects	47	analyzing the results of the buffered acid experiment
						48	sequencing events
						48	reconstruct a series of events from clues
						59	concluding which conditions affect the timeing and duration and intensity of an earthquake based on observation
						59	interpreting how the drumming affects the intensity of the earthquake in the model
						6	effect of changing mass on data
						65	justify which scenario was most likely

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
						80	investigation discovering relationship between orbital speed and distance
						9	explaining efficiency of heat transfer based on data
InqHS.01.e Investigation and Experimentation	Standard	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop questions and perform investigations.	Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.	11	heat equation	3	find equation for trend line
				164	astronomic numbers expressed in scientific notation	81	inverse square law
				166	calculating light year using scientific notation	95	calculating solar brightness units (SBU) from kilometers in scientific notation
				175	converting numbers to scientific notation		
				180	determining Earth's mass using scientific notation		
				219	inverse square law		

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InqHS.01.f Investigation and Experimentation	Standard	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop questions and perform investigations.	Distinguish between hypothesis and theory as scientific terms.	92	forming a hypothesis and testing through experimentation (#5)	18	investigating the effect of greenhouse gases
				92	describe steps you would take to determine how pH affects frog population	21	investigating how specific heat of water regulates Earth's temperature
				95	relative dating and modern geology based on Steno's theories	22	analyzing data
				98	Kelvin's calculations of Earth's age	24	developing a hypothesis
				102	theory of plate tectonics	24	formulate a hypothesis about why the seasons occur
				103	critiquing Wegener's theories of continental drift	4	conducting investigation of efficiency of immersion heater
				104	proving hypotheses for sea-floor spreading	43	analyzing results and drawing conclusions
				137	Darwin's theories of the Andes formation	44	simulating the effect of acid rain on daphnia
				140	what causes ice ages	44	formulate hypothesis
				154	form a hypothesis	61	develop a research plan for studying volcanoes
				176	identify question, hypothesis, procedure, and results (#1)	9	conducting experiments on heat transfer
				185	theories of origin of the moon		
				186	early theories of the solar system		
				221	Big Bang theory		

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
InqHS.01.g Investigation and Experimentation	Standard	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop questions and perform investigations.	Recognize the usefulness and limitations of models and theories as scientific representations of reality.	11	heat equation	13	constructing a graph from atmospheric pressure data
				37	computer modeling to predict greenhouse effects	18	modeling the effect of greenhouse gases on Earth's temperature
				46	modeling air currents	19	graphing water and ice temperature readings
				70	create a model (#1)	22	constructing a graph of time vs. temperature
				98	model of Earth's history	28	modeling underwater rivers and waterfalls and springs
				107	modeling plate boundaries	3	find equation for trend line
				150	rock cycle model	3	construct a graphical model
				188	solar system modeling	47	constructing a graph of drops of acid vs pH
				198	model of the sun's anatomy	5	construct a temperature vs. time graph
				219	inverse square law	55	evaluating your completed bathymetric map
						56	construct a model that simulates an earthquake
						71	evaluate your ability to interpret rock formations
						81	inverse square law
						82	setting up a scale model of the solar system

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Standard #: Subject	Topic	Standard	Benchmark	student text pg	detail	investigation pg	detail
InqHS.01.j Investigation and Experimentation	Standard	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop questions and perform investigations.	Recognize the issues of statistical variability and the need for controlled tests.			12 27 30 6	writing a procedure for constructing a pointer for an aneroid barometer determining whether distance from light source or axial tilt plays a more significant role in causing the seasons develop a procedure to create an underwater spring effect of changing mass on collected data
InqHS.01.k Investigation and Experimentation	Standard	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop questions and perform investigations.	Recognize the cumulative nature of scientific evidence.	25 56 222	why do ears pop meteorologists use atmospheric pressure data to understand movement of weather systems evidence for Big Bang theory	31	the food paradox of the oceans

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InqHS.01.I Investigation and Experimentation	Standard	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop questions and perform investigations.	Analyze situations and solve problems that require combining and applying concepts from more than one area of science.	122	describe the work of a geologist and paleontologist and seismologist	40	water quality testing

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InqHS.01.m Investigation and Experimentation	Standard	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop questions and perform investigations.	Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources…	35	hydrogen powered cars	17	research the causes of ozone in the lower atmosphere
				77	the clean water act	86	solar energy can be used to generate electricity without producing pollution
				80	effect of excess nitrates on environment		
				82	impact of using fossil fuels		
				83	catalytic converters and scrubbing reduce acid rain		
				92	research economic impact of producing gases that cause acid rain		
				112	what we can learn from seismographs		
				118	understanding earhquakes allows engineers to design safer buildings		
				201	using photovoltaic cells		

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InqHS.01.n Investigation and Experimentation	Standard	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop questions and perform investigations.	Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent and that the theory is sometimes wrong.	37	what percentage comes from this source? (problem 4)	13	evaluating your aneroid barometer design
				98	Kelvin's calculations of Earth's age	13	calculating error between your barometer and a commercial barometer
				117	determining distance to an epicenter	15	importance of good record keeping in order to avoid error
				121	what explains the difference in density? (#5)	16	evaluating your qualitative ozone strips
				179	how big is Earth?	24	testing hypothesis of why seasons occur against your observations in the investigation
						44	making hypotheses and testing them against observations
						47	analyzing the results of the buffered acid experiment
						48	reconstruct a series of events from clues
						59	interpreting how the drumming affects the intensity of the earthquake in the model
						9	explaining efficiency of heat transfer based on data