Correlation to Kentucky Program of Studies: High School Science Skills and Concepts

Foundations of Physical Science with Earth and Space Science (Second Edition)

Student Text and Investigation Manual

Standard #: Grade Level	Subject Area	Big Idea	Skills and Concepts	Volume 1 Student Text Page	Volume 2 Investigation Manual Page
SC-H-EU-S-01 High School	Earth/Space Science	The Earth and the Universe	compare methods used to measure the ages of geologic features	527 origin of fossils 528 relative dating 528 relative dating 529 interpreting rock formations 529 faunal succession 530 calculating Earth's age 530 table and description of the geologic time scale 561 formation of Hawaiian Islands due to volcanic activity 564 volcanoes shape the Earth 569 constructive process of mountain building 570 the destructive process of erosion 571 wind erosion 572 ice ages 575 studying moon rocks on Earth	225 determining the relative ages of rock formations 226 sequencing events in a geologic cross-section 240 estimating the effects of meteor impacts on Earth 241 identifying which geologic features on Earth were caused by meteors

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SC-H-EU-S-02 High School	Earth/Space Science	The Earth and the Universe	research the historical rise in acceptance of the theory of Plate Tectonics and the geological/biological consequences of plate movement	534 definition of plate tectonics 538 theory of plate tectonics 539 describing plate boundaries 540 divergent plate boundaries 541 convergent plate boundaries 542 transform plate boundaries	229 identifying tectonic plates and plate boundaries
SC-H-EU-S-03 High School	Earth/Space Science	The Earth and the Universe	analyze the supporting evidence for the nebular theory of formation of the solar system	619 explanation and illustration of the solar system 620 relative sizes and distances within the solar system 647 how the solar system was formed 649 the structure of the Milky Way Galaxy	258 setting up a scale model of the solar system 259 determining scale distances for the planets 260 determining scale sizes of the planets
SC-H-EU-S-04 High School	Earth/Space Science	The Earth and the Universe	analyze the supporting evidence for the Big Bang theory of formation of the universe	654 evidence for the Big Bang theory 655 evidence for the Big Bang theory	

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SC-H-EU-S-05 High School	Earth/Space Science	The Earth and the Universe	explain the role of gravity in the formation and function of the universe	52 52 54 55 612	gravity depends on mass the effect of gravity Newton's law of universal gravitation calculating gravitational force between objects Newton's law of universal gravitation	20 257	investigate effect of gravity on motion relating the relationship between orbital speed and distance to the equation of universal gravitation
SC-H-EU-S-06 High School	Earth/Space Science	The Earth and the Universe	investigate, describe and document patterns of interaction of matter and gravity	618 618 619 625 626 645 646	orbits of planets around the sun Johannes Kepler Kepler's elliptically shaped orbits asteroids and comets meteors and meteorites and the Kuiper Belt 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	256 264	simulate an object in orbit and investigate how orbital period varies within distance using spectroscopy to analyze the light emitted by stars and identify most common elements

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SC-H-EU-S-07 High School	Earth/Space Science	The Earth and the Universe	describe the life cycle of stars and the products/consequences of their deaths	644 the life cycle of stars 645 description and illustration of the life cycle of stars 646 elements formed by nuclear fusion in stars	255 observe and describe the appearance of the moon and Jupiter and its moons
SC-H-EU-S-08 High School	Earth/Space Science	The Earth and the Universe	explain how technological solutions permit the study of phenomena too faint, small, distant or slow to be directly measured	598 calculating and using light years 599 light years and time 600 history of the telescope 601 types and uses of telescopes 602 types and uses of telescopes 602 photo from the Very Large Array 603 satellites as tools of astronomy 604 spacecraft as tools of astronomy 640 the use of spectroscopy to analyze stars	264 understand why spectroscopy is an important tool of astronomers 268 calculating the distance to stars and galaxies using apparent brightness and absolute brightness 268 measuring apparent brightness to calculate the distance to stars and galaxies

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SC-H-EU-S-09 High School	Earth/Space Science	The Earth and the Universe	employ scientific notation to communicate and compare astronomical phenomena	596 astronomic numbers expressed in scientific notation 598 calculating light year using scientific notation 607 converting numbers to scientific notation 612 determining Earth's mass using scientific notation	271 calculating solar brightness units (SBU) from kilometers in scientific notation

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Standard #: Grade Level	Subject Area	Big Idea	Skills and Concepts	Volume 1 Student Text Page	Volume 2 Investigation Manual Page
SC-H-EU-S-10 High School	Earth/Space Science	The Earth and the Universe	explore real-life implications of current findings in Earth/space research and communicate findings in an authentic form, exemplifying the traits of curiosity, honesty, openness and skepticism	178 generating electric power 491 computer modeling to predict greenhouse effects 499 convection currents in the atmosphere 501 global wind patterns 508 effects of moving air masses 508 cold fronts 509 jet streams 509 warm fronts 514 causes and effects of the El Nino Southern Oscillation 543 earthquakes and plate tectonics 548 using seismic waves for oil and gas exploration 558 geologic basis for volcanic eruptions 558 formation of magma in Earth's mantle 559 where volcanic activity occurs 561 geologic basis for shield volcanoes 562 geologic basis for stratovolcanoes	213 exploring how temperature-dependent layering creates currents 262 determine the efficiency of a photovoltaic cell

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Standard #: Grade Level	Subject Area	Big Idea	Skills and Concepts	Volume 1 Student Text Page		Volume 2 Investigation Manual Page
				563	geologic bases for cinder cone volcanoes	
				566	description of geothermal energy	
				566	mineral deposits and diamonds	
				574	environmental impact of urban sprawl	
				605	how the space shuttle works	
				617	historical theories of the origin of the moon	
				618	historical theories about the solar system	
				627	historical theories of which objects were planets	
				633	the efficiency of photovoltaic cells	
				653	the Big Bang theory of the origin of the universe	

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SC-H-MF-S-01 High School	Physical Science	Motion and Forces	design and conduct investigations involving the motion of objects and report the results in a variety of ways	14	how to calculate speed	9	collect data and calculate speed of car
				15	compare and contrast speed and velocity	10	calculate speed of the car
				20	calculate speed of car	12	model the car's motion graphically
				20	find speed of bumblebee	12	calculate speed of moving car
				24	accurate speed measurements	12	find speed of car at different positions
				29	position vs. time graph discussion	13	make a position vs. time graph
				30	position vs. time graphs	14	calculate speed of car at two places on the ramp
				32	average speed vs. instantaneous	15	make a speed vs. time graph
				36	examples of acceleration	15	changes in motion can be represented graphically
				37	speed vs. time graphs	15	make a speed vs. time graph
				37	speed vs. time graph discussion	17	caclulate speed of car
				42	calculate speed from distance/time graph	36	find speed of marble

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Standard #: Grade Level	Subject Area	Big Idea	Skills and Concepts	Volume 1 Student Text Page		Volume 2 Investigation Manual Page	
SC-H-MF-S-02 High School	Physical Science	Motion and Forces	investigate Newton's Laws of Motion and Gravitation. Experimentally test inertia and gravitational acceleration	45	Newton's third law summarized	14	exploring acceleration on a ramp
				45	Newton's second law summarized	16	thinking about force
				45	Newton's first law summarized	19	discover 2nd law of motion
				48	Newton's first law in detail	20	investigate effect of gravity on motion
				49	Newton's second law in detail	22	car and ramp and Newton's 3rd law
				52	gravity depends on mass	23	using 3rd law to explain common phenomena
				52	the effect of gravity	257	relating the relationship between orbital speed and distance to the equation of universal gravitation
				54	Newton's law of universal gravitation		
				55	calculating gravitational force between objects		
				59	Newton's third law in detail		
				64	solving problems using f=ma		
				612	Newton's law of universal gravitation		
SC-H-MF-S-03 High School	Physical Science	Motion and Forces	experimentally test conservation of momentum. Use tables, charts and graphs in making arguments and claims in oral and written presentations	60	law of conservation of momentum		
				100	conservation of momentum and swimming		

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Standard #: Grade Level	Subject Area	Big Idea	Skills and Concepts	Volume 1 Student Text Page	Volume 2 Investigation Manual Page
SC-H-MF-S-04 High School	Physical Science	Motion and Forces	create and analyze graphs, ensuring that they do not misrepresent results by using inappropriate scales or by failing to specify the axes clearly	24 making a graph 26 creating graphs 41 make a graph	13 graph distance vs. time 15 construct a quantitative graphical model 37 organize data into a graph of speed vs. height 51 graph voltage vs. current 121 graph mass vs. volume 147 organize observations into a category table 185 constructing a graph of drops of acid vs pH 187 construct a graphical model 189 construct a temperature vs. time graph 197 constructing a graph from atmospheric pressure data 203 graphing water and ice temperature readings 206 constructing a graph of time vs. temperature

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SC-H-MF-S-05 High School	Physical Science	Motion and Forces	develop investigable questions that guide explorations of the interrelationship between electricity and magnetism	170	what is an electromagnet?	66	build an electromagnet
				172	building an electromagnet	67	find out what happens to strength of electromagnet when current is increased
				172	increased current vs. strength of magnetic field	68	investigate how an electric motor works
				174	how electric motors work	73	use magnetic induction to create an electric field
				176	dissecting an electric motor	73	exploring electric generators
				177	electromagnetic induction explained		
SC-H-MF-S-06 High School	Physical Science	Motion and Forces	investigate the attraction and repulsion of electrical charges to predict the behavior of charged objects	111	charge is a fundamental property of matter	42	investigate electric charge
				112	static charge discussed		
				113	explanation of coulomb		
				114	how an electroscope works		
				114	electroscopes		

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Standard #: Grade Level	Subject Area	Big Idea	Skills and Concepts	Volume 1 Student Text Page		Volume 2 Investigation Manual Page	
SC-H-MF-S-07 High School	Physical Science	Motion and Forces	create conceptual and mathematical models of motion and test them against real-life phenomena	14	how to calculate speed	9	collect data and calculate speed of car
				20	calculate speed of car	10	calculate speed of the car
				20	find speed of bumblebee	12	calculate speed of moving car
				24	accurate speed measurements	12	find speed of car at different positions
				30	position vs. time graphs	13	make a position vs. time graph
				32	average speed vs. instantaneous	14	calculate speed of car at two places on the ramp
				37	speed vs. time graphs	15	make a speed vs. time graph
				42	calculate speed from distance/time graph	17	caclulate speed of car
				42	interpreting distance/time graph	25	create a mathematical model
				465	heat equation	27	find math rule for lever equilibrium
				651	inverse square law	28	derive a math formula
						36	find speed of marble
						187	find equation for trend line
						257	inverse square law
						268	discovering the mathematical relationship betwen apparent brightness and distance
						275	calculating bicycle gear ratios

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Standard #: Grade Level	Subject Area	Big Idea	Skills and Concepts	Volume 1 Student Text Page		Volume 2 Investigation Manual Page	
SC-H-MF-S-08 High School	Physical Science	Motion and Forces	explain why the strength of the nuclear force is responsible for the great energy release involved in nuclear reactions	393	fusion and fission explained	138	fusion and fission
				394	nuclear vs chemical reactions	138	nuclear reactions
				629	nuclear fusion and the sun	160	radioactive decay
						160	how do you simulate nuclear decay?
SC-H-MF-S-09 High School	Physical Science	Motion and Forces	predict which forces would be predominant in a given system and explain	51	net force explained	16	unbalanced forces and acceleration of car
				51	balanced and unbalanced forces	20	investigate effect of gravity on motion
				52	the effect of gravity	21	effect of friction on the car
				56	friction explained		
				64	research effect of friction on human joints		
				67	how simple machines manipulate forces		
				70	mechanical advantage of block and tackle		
				71	parts of a lever		
				72	mechanical advantage of a lever		
				77	how gears work		

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Standard #: Grade Level	Subject Area	Big Idea	Skills and Concepts	Volume 1 Student Text Page	Volume 2 Investigation Manual Page
SC-H-STM-S-01 High School	Physical Science	Structure and Transformation of Matter	classify samples of matter from everyday life as being elements, compounds, or mixtures	284 pure substances cannot be separated by physical means 284 mixtures can be separated by physical means 289 atoms and molecules 317 all matter is formed from atoms 317 all matter is formed from atoms 413 solutions are mixtures 414 colloids and suspensions 432 mixtures and emulsifying agents	114 investigating a mixture 114 separating a homogeneous mixture 132 comparing atoms 141 compare and contrast elements and compounds

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SC-H-STM-S-02 High School	Physical Science	Structure and Transformation of Matter	Investigate the kinetic molecular theory of matter	290 states of matter and arrangement of molecules 411 molecular structure of ice 457 temperature is a measure of average kinetic energy 459 comparing temperature in Fahrenheit and Celsius scales 460 changes in temperature are directly related to changes in energy 462 definition of specific heat 462 specific heat 464 water's specific heat helps regulate Earth's temperature 465 heat equation 467 thermal conductivity explained	118 molecules in a liquid 118 investigate melting 118 think of melting process at molecular level 119 investigate temperature and energy transfer in melting process 186 develop a way to convert between Fahrenheit and Celsius temperature scales 188 investigate the increase of temperature of water as thermal energy is added 205 investigating how the high specific heat of water helps regulate Earth's temperature

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Standard #: Grade Level	Subject Area	Big Idea	Skills and Concepts	Volume 1 Student Text Page	Volume 2 Investigation Manual Page
SC-H-STM-S-03 High School	Physical Science	Structure and Transformation of Matter	construct and/or interpret diagrams that illustrate ionic and covalent bonding	330 which element is more likely to combine with other elements? 330 use the periodic table to predict chemical formulas 336 ionic bonds 337 covalent bonds 338 distinguishing between ionic and covalent bonds 341 chemical bonding and the periodic table 415 dissolving an ionic compound 416 solute dissolution depends on chemical bonds	136 ions 141 whan an atom ionizes 141 modeling a chemical bond 143 classify ionic compounds 143 ionic compounds

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Standard #: Grade Level	Subject Area	Big Idea	Skills and Concepts	Volume 1 Student Text Page	Volume 2 Investigation Manual Page
SC-H-STM-S-04 High School	Physical Science	Structure and Transformation of Matter	predict compound formation and bond type as either ionic or covalent	330 which element is more likely to combine with other elements? 330 use the periodic table to predict chemical formulas 336 ionic bonds 337 covalent bonds 338 distinguishing between ionic and covalent bonds 341 chemical bonding and the periodic table 342 writing a chemical formula 344 summary of chemical formula writing rules 345 naming compounds 415 dissolving an ionic compound 416 solute dissolution depends on chemical bonds	141 modeling a chemical bond 143 classify ionic compounds 143 name chemical compounds 143 predict chemical formulas 145 determine empirical formula
SC-H-STM-S-05 High School	Physical Science	Structure and Transformation of Matter	identify and test variables that affect reaction rates	370 formation of petroleum is a very slow chemical reaction	156 predict products in a double displacement reaction 170 design experiments to explore dissolving rate

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SC-H-STM-S-06 High School	Physical Science	Structure and Transformation of Matter	use evidence/data from chemical reactions to predict the effects of changes in variables (concentration, temperature, properties of reactants, surface area and catalysts)	370 formation of petroleum is a very slow chemical reaction	156 predict products in a double displacement reaction 170 design experiments to explore dissolving rate
SC-H-STM-S-07 High School	Physical Science	Structure and Transformation of Matter	explore the relationships among temperature, particle number, pressure and volume in the Universal Gas Law	305 Charles' law 306 Boyle's law	

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SC-H-STM-S-08 High School	Physical Science	Structure and Transformation of Matter	explain the organizational structure (design) and communicate the usefulness of the Periodic Table to determine potential combinations of elements	321 atomic number discussed 322 mass number discussed 326 groups of elements 327 groups of elements and valence shells 327 studying the periodic table 328 atomic number on the periodic table 328 chemical symbols and element names 328 atomic mass on the periodic table 328 mass number on the periodic table 335 periodic table columns and valence electrons 336 bonding and periodic table position 338 periodic table and electronegativities 338 metals nonmetals and metalloids 341 periodic table and oxidation numbers	133 using the periodic table 133 identify mass number 133 identify element symbol and name 133 identify atomic number 136 building and studying the periodic table 136 atomic number 136 mass number 141 build model of Na and Cl atoms and explain why they bond to form a molecule 142 arrangement of electrons and groups of elements

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SC-H-STM-S-09 High School	Physical Science	Structure and Transformation of Matter	investigate the role of intermolecular or intramolecular interactions on the physical properties (solubility, density, polarity, boiling/melting points) of compounds	290 melting and boiling points 290 melting and boiling point explained 291 table of melting and boiling points 297 density is independent of amount of substance 298 elasticity is a physical property of matter 298 hardness is a physical property of matter 299 brittleness is a physical property of matter 300 tensile strength is a physical property of matter 300 malleability is a physical property of matter 301 relationship between mass volume and density	116 mass and volume measurements 119 melting point of ice 124 build a density column 212 investigate density changes in the oceans as the cause of ocean layering

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SC-H-STM-S-10 High School	Physical Science	Structure and Transformation of Matter	relate the chemical behavior of an element, including bonding, to its location on the periodic table	327 groups of elements and valence shells 335 periodic table columns and valence electrons 336 bonding and periodic table position 338 periodic table and electronegativities 341 periodic table and oxidation numbers	141 build model of Na and Cl atoms and explain why they bond to form a molecule 142 arrangement of electrons and groups of elements
SC-H-STM-S-11 High School	Physical Science	Structure and Transformation of Matter	relate the structure of water to its function as the universal solvent	409 water structure and its function as a solvent 409 a water molecule is v-shaped 415 why water is called the universal solvent	
SC-H-STM-S-12 High School	Physical Science	Structure and Transformation of Matter	design and conduct experiments to determine the conductivity of various materials	127 electrical conductivity explained 467 thermal conductivity explained	49 conductivity of aluminum vs. copper

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SC-H-STM-S-13 High School	Physical Science	Structure and Transformation of Matter	create and/or interpret graphs and equations to depict and analyze patterns of change	24	making a graph	13	graph distance vs. time
				26	creating graphs	15	construct a quantitative graphical model
				41	make a graph	25	create a mathematical model
				42	interpreting distance/time graph	27	find math rule for lever equilibrium
				465	heat equation	28	derive a math formula
				651	inverse square law	37	organize data into a graph of speed vs. height
						51	graph voltage vs. current
						121	graph mass vs. volume
						147	organize observations into a category table
						185	constructing a graph of drops of acid vs pH
						187	find equation for trend line
						187	construct a graphical model
						189	construct a temperature vs. time graph
						197	constructing a graph from atmospheric pressure data
						203	graphing water and ice temperature readings
						206	constructing a graph of time vs. temperature
						257	inverse square law

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Standard #: Grade Level	Subject Area	Big Idea	Skills and Concepts	Volume 1 Student Text Page	Volume 2 Investigation Manual Page
					268 discovering the mathematical relationship betwen apparent brightness and distance 275 calculating bicycle gear ratios

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SC-H-STM-S-14 High School	Physical Science	Structure and Transformation of Matter	explore real-life applications of a variety of chemical reactions (e.g., acids and bases, oxidation, rusting, tarnishing) and communicate findings/present evidence in an authentic form (transactive writing, public speaking, multimedia presentations)	363 combustion reaction 367 chemical reactions in living systems 367 heartburn reaction 370 carbon chains 384 combustion reactions 384 consumer chemistry 387 MRE ration heater reaction 401 chemistry of the atmosphere 401 chemistry of the atmosphere 403 carbon reactions 424 formulas and reactions of acids and bases 425 dissociation of water 426 concentration of hydronium ions determines pH and strength of acids and bases 428 examples of acid and base chemistry 428 pH and blood 443 concentration of ions and pH 443 pH of acid rain	148 chemical equations 162 investigating combustion reactions 162 carbon reactions and the environment 176 measure pH of everyday solutions 276 create a report with a diagram, data table, and conclusion

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				444	chemical reactions and the formation of acid rain	

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SC-H-STM-S-15 High School	Physical Science	Structure and Transformation of Matter	generate investigable questions and conduct experiments or non-experimental research to address them, using evidence to defend conclusions	7	experimentation begins with a question	6	predict which car will move fastest
				9	steps in the scientific method	7	perform your own experiment
				10	forming a hypothesis	7	compare results with hypothesis
				11	control and experimental variables	7	test the effect of one other variable
				19	design your own experiment	7	design your own experiment
				19	which group did the best experiment?	7	doing a controlled experiment
				19	design your own experiment	7	variables in an experiment
				26	independent and dependent variables	9	devise a hypothesis
				42	devise an experiment	9	design three experiments using car and ramp
				454	forming a hypothesis and testing through experimentation (#5)	10	conduct car/ramp experiment
				454	describe steps you would take to determine whether pH affects frog population	16	investigate Newton's 2nd law
				457	what is temperature	16	decide how to vary the force on the car for this experiment
				608	identify question, hypothesis, procedure, and results (#1)	18	evaluate graphs as to whether or not they show relationships between variables

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					21 choose independent and dependent variables for graph 21 evaluate percent change for data collected 26 what variables can be changed? 27 think about the variables 27 recognize variables 34 where does the marble move the fastest? 34 investigate motion on a rollercoaster 40 choose circuit parts to light a bulb 43 how did A and B tapes acquire different charge? 75 perform self-designed experiment 75 investigate variables that affect the period of a pendulum 75 evaluate statistical significance 75 plan three experiments to determine which variable affects the period of a pendulum

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					75 design pendulum experiment 93 decision trees and the advantage of doing multiple trials 151 design experiment to find out if mass is conserved 151 explain how hypothesis compares to results 151 perform the experiment you designed 157 add new rules to list based on findings 170 which factor will produce fastest dissolving rate? 170 devise hypothesis and explain 170 which method will give fastest dissolving rate? 170 what three factors influence dissolving rate? 171 evaluate method based on data 182 simulating the effect of acid rain on daphnia 188 conducting investigation of efficiency of immersion heater

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Standard #: Grade Level	Subject Area	Big Idea	Skills and Concepts	Volume 1 Student Text Page	Volume 2 Investigation Manual Page
					190 effect of changing mass on collected data 193 conducting experiments on heat transfer 197 evaluating your aneroid barometer design 200 evaluating your qualitative ozone strips 205 investigating how specific heat of water regulates Earth's temperature 208 testing hypothesis of why seasons occur against your observations in the investigation 211 determining whether distance from light source or axial tilt plays a more significant role in causing the seasons 233 identifying how the earthquake model represents an earthquake 237 develop a research plan for studying volcanoes