

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

<b>Standard #: Content Area</b>	<b>Topic</b>	<b>Fundamental Concept</b>	<b>student text pg</b>	<b>detail</b>	<b>investigation pg</b>	<b>detail</b>
INQ01.1 Inquiry	Abilities Necessary to do Scientific Inquiry	Identify questions and concepts that guide scientific investigations	7	experimentation begins with a question	6	how do we ask questions and get answers from nature?
			10	the research question and hypothesis	7	perform your own experiment
			19	design your own experiment	7	design your own experiment
			42	devise an experiment	9	design three experiments using car and ramp
					10	conduct car/ramp experiment
					16	decide how to vary the force on the car for this experiment
					16	investigate Newton's 2nd law
					26	what variables can be changed?
					34	investigate motion on a rollercoaster
					75	design pendulum experiment
					75	perform self-designed experiment
					93	decision trees and the advantage of doing multiple trials
					151	design experiment to find out if mass is conserved

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Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					166	what three factors influence dissolving rate?
					166	which method will give fastest dissolving rate?
					198	which type of food contains the most energy?

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INQ01.2 Inquiry	Abilities Necessary to do Scientific Inquiry	Design and conduct scientific investigations	7	experimentation begins with a question	6	predict which car will move fastest
			9	steps in the scientific method	7	perform your own experiment
			10	forming a hypothesis	7	test the effect of one other variable
			11	control and experimental variables	7	compare results with hypothesis
			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	9	conduct three experiments with appropriate equipment
			20	finding variability in data	9	design three experiments using car and ramp
			26	independent and dependent variables	9	design three experiments and choose technology
			28	identifying cause and effect relationships	9	design three experiments and choose equipment
			41	identify cause and effect	10	conduct car/ramp experiment
			42	devise an experiment	10	selecting ramp and photogates
			79	look at force data and decide the usefulness of a machine	12	select equipment and set up experiment
			288	find the thickness of a single card	14	record three different time intervals

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Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					16	investigate Newton's 2nd law
					16	decide how to vary the force on the car for this experiment
					18	use data to describe relationship between force and motion
					18	evaluate graphs as to whether or not they show relationships between variables
					19	use data to infer correct relationship between variables
					20	safety tip for car/ramp setup
					21	evaluate percent change for data collected
					21	determine effect of increasing mass
					21	choose independent and dependent variables for graph
					24	ropes and pulley safety
					25	collect force data
					26	safety tip for hanging weights from lever
					26	what variables can be changed?

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

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

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Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					151	plan procedures and select materials
					151	select materials from list
					158	wear goggles and apron
					164	safety equipment
					166	which factor will produce fastest dissolving rate?
					166	what three factors influence dissolving rate?
					167	evaluate method based on data
					168	hot water safety
					172	safety tip for water testing
					174	visit local water supply and perform testing
					177	research pH indicators
					180	thermometer safety
					182	heat safety
					186	thermometer safety
					192	heat safety
					198	heat safety
					200	safely using rubber bands
					201	research electricity generation

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

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Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					15	calculating acceleration from the slope of the line
					16	measure force
					17	record results in data table
					17	record times
					18	organize different combinations of data
					18	study data table for relationship between force and motion
					21	think about percent change
					24	use data table to record results
					24	collect weight data
					25	analyze block and tackle data
					27	analyze lever equilibrium data
					27	use data table to record results
					30	record ropes and pulley data in table
					35	does data support hypothesis?
					36	collect precise speed and height data
					36	organize data into a table

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Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					44	measure voltage
					45	did battery voltage change?
					46	measure current
					48	measure resistance
					75	collect mass and amplitude data
					75	create data table for self-designed experiment
					76	analyze pendulum data
					76	calculate % error
					87	measure wavelength
					116	measure mass
					117	measure volume
					129	find average velocity
					129	control the height of the liquid
					147	students analyze chemical change lab results
					151	design a data table
					165	what does the word "control" mean?
					165	why was plain water tested?
					167	average dissolving rate

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Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					<p>167 use data table for observations</p> <p>167 collect time data and record observations</p> <p>173 organize water quality data into a table</p> <p>180 measure temperature</p>	

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INQ01.4 Inquiry	Abilities Necessary to do Scientific Inquiry	Formulate and revise scientific explanations and models using logic and evidence	23	why make models?	13	graph distance vs. time
			24	scientific models	15	construct a quantitative graphical model
			24	what is a scientific model?	21	construct reasonable explanation based on data
			24	making a graph	25	create a mathematical model
			26	creating graphs	27	find math rule for lever equilibrium
			41	make a graph	28	derive a math formula
			42	interpreting distance/time graph	35	study data and determine importance of height on speed of marble
					37	organize data into a graph of speed vs. height
					45	analyze data and explain a rule
					51	graph voltage vs. current
					121	graph mass vs. volume
					147	organize observations into a category table
					151	does your experiment agree with law of conservation of mass?
					151	do the data support the hypothesis
					157	add new rules to list based on findings

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Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					167	what was happening at molecular level?
					181	construct a graphical model
					183	construct a temperature vs. time graph
INQ01.5 Inquiry	Abilities Necessary to do Scientific Inquiry	Recognize and analyze alternative explanations and models	10	process of reviewing hypothesis explained	35	what evidence is there in support of your hypothesis?
					39	critique group's explanation of energy transformations
					39	review energy theory in context of everyday scenarios
					39	analyze energy transformations in different scenarios
					77	show how energy loss data could be applied to designing a real clock
					77	compare law of conservation of energy to motion of pendulum
					151	review your hypothesis
					167	did you prove or disprove your hypothesis?

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INQ01.6 Inquiry	Abilities Necessary to do Scientific Inquiry	Communicate and defend a scientific argument	20 27	explain your reasoning how to read a graph		vocabulary is presented in context of investigations  students are encouraged to keep a lab notebook  9 present conclusions to the class  9 reporting on an experiment  37 describe the flow of energy based on experimental graph  39 give a brief presentation to the class  41 drawing and interpreting circuit diagrams  47 present and defend an explanation  78 reading harmonic motion data tables and graphs  145 present findings and methods used  145 present findings to the class  151 present results to the class  173 write paragraph to explain results  175 create water quality report

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Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					179 write summary of findings	

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

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			321	Mendeleev's periodic table		
			332	Linus Pauling and electronegativities		
			343	Avogadro's number		
			363	history of law of conservation of mass		
			363	Antoine Lavoisier		
			370	research Lavoisier's contributions		
			391	scientific discovery and the atomic age		
			393	accomplishments of Marie Curie		
			393	Marie and Pierre Curie		
			393	history of nuclear chemistry		
			395	impact of industrial revolution		
			400	research the Clean Air Act of 1970 and 1990		
			434	research local water supply history		
			456	contributions of Joule		
			464	research the history of heat and temperature		

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INQ02.2 Inquiry	Understandings About Scientific Inquiry	Scientists conduct investigations for a wide variety of reasons. For example, they may wish to discover new aspects of the natural world, explain recently observed phenomena, or test the conclusions of prior investigations or the predictions of current...	58 78 120	Newton on a skateboard describe a problem that would be solved by an engineer circuits in your house	6 39	asking questions and learning about natural world study energy transformations in daily life scenarios

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

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Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
					44	measure voltage
					46	measure current
					46	using electrical meter
					48	measure resistance
					48	using electrical meter
					50	using electrical meter
					75	collect mass and amplitude data
					86	use CPO Timer to measure frequency
					87	measure wavelength
					107	study reflection of laser beam
					108	study refraction of laser beam
					113	trace critical angle with a laser beam
					116	measure mass
					117	measure volume
					158	use a thermometer
					167	collect time data and record observations
					180	measure temperature

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INQ02.4 Inquiry	Understandings About Scientific Inquiry	Mathematics is essential in scientific inquiry. Mathematical tools and models guide and improve the posing of questions, gathering data, constructing explanations and communicating results.	42	interpreting distance/time graph	25 27 28	create a mathematical model find math rule for lever equilibrium derive a math formula

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

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INQ02.6 Inquiry	Understandings About Scientific Inquiry	Results of scientific inquiry- new knowledge and methods- emerge from different types of investigations and public communication among scientists. In communicating and defending the results of scientific inquiry, arguments must be logical and demonstrate...	23 24 24	why make models? scientific models what is a scientific model?	163	evaluating choice of favorite car
PS01.1 Physical Science	Structure of Atoms	Matter is made of minute particles called atoms, and atoms are composed of even smaller components. These components have measurable properties, such as mass and electrical charge...	311 311 311 311 318 389 389 389	all matter is formed from atoms all matter is formed from atoms protons/neutrons/electrons location/size/charge of subatomic particles proton/electron attraction electromagnetic force strong nuclear force forces in the nucleus	132 132 133 133 136 136 137 140	comparing atoms building atom models protons and neutrons location of electrons in atom strong force model stable and neutral atoms build atomic models review subatomic particles

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

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

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

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PS02.3 Physical Science	Structure and Properties of Matter	Bonds between atoms are created when electrons are paired up by being transferred or shared. A substance composed of a single kind of atom is called an element...	278	compounds are composed of elements	136	ions
			324	use the periodic table to predict chemical formulas	140	who do atoms form chemical bonds?
			324	which element is more likely to combine with other elements?	141	whan an atom ionizes
			330	ionic bonds	141	modeling a chemical bond
			331	covalent bonds	142	who do atoms combine in certain ratios?
			332	distinguishing between ionic and covalent bonds	143	classify ionic compounds
			335	chemical bonding and the periodic table	143	name chemical compounds
			336	writing a chemical formula	143	predict chemical formulas
			338	summary of chemical formula writing rules	143	ionic compounds
			339	naming compounds	144	show ratios in which elements combine to form a compound
			343	mole quantities	145	determine empirical formula
			364	carbon chains	162	carbon reactions and the environment

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PS02.4 Physical Science	Structure and Properties of Matter	The physical properties of compounds reflect the nature of the interactions among its molecules. These interactions are determined by the structure of the molecule, including the constituent atoms and the distances and angles between them.	421  421	water structure and its function as a solvent  a water molecule is v-shaped		
PS02.5 Physical Science	Structure and Properties of Matter	Solids, liquids, and gases differ in the distances and angles between molecules or atoms and therefore the energy that binds them together. In solids the structure is nearly rigid; in liquids molecules or atoms move around each other but...	284  285	states of matter and arrangement of molecules  characteristics of matter related to its state	118  118 118 118	observe melting process and study quantitatively  investigate melting molecules in a liquid think of melting process at molecular level

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PS02.6 Physical Science	Structure and Properties of Matter	Carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures, including synthetic polymers, oils, and the large molecules essential to life	364	carbon chains	162	carbon reactions and the environment
PS03.1 Physical Science	Chemical Reactions	Chemical reactions occur all around us, for example in health care, cooking, cosmetics, and automobiles. Complex chemical reactions involving carbon-based molecules take place constantly in every cell in our bodies.	361 378 378 381 395 395 397 444 487	chemical reactions in living systems consumer chemistry combustion reactions MRE ration heater reaction chemistry of the atmosphere chemistry of the atmosphere carbon reactions chemical reactions and the formation of acid rain chemical reactions in living systems	148 162	chemical equations investigating combustion reactions

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PS03.2 Physical Science	Chemical Reactions	Chemical reactions may release or consume energy. Some reactions such as the burning of fossil fuels release large amounts of energy by losing heat and by emitting light. Light can initiate many chemical reactions such as ...	381  382	exothermic reactions and MREs  endothermic reactions and cold packs	158  158	investigate energy changes in chemical reactions  measure energy changes in 3 different reactions
PS03.3 Physical Science	Chemical Reactions	A large number of important reactions involve the transfer of either electrons (oxidation/reduction reactions) or hydrogen ions (acid/base reactions) between reacting ions, molecules, or atoms. In other reactions, chemical bonds...	437  440  443	concentration of ions and pH  examples of acid and base chemistry  pH and blood	176	measure pH of everyday solutions

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

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

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

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PS04.4 Physical Science	Motion and Forces	Between any two charged particles, electric force is vastly greater than the gravitational force. Most observable forces such as those exerted by a coiled spring or friction may be traced to electric forces acting between atoms and molecules.	106  106	electrical force is incredibly strong!  electrical forces		
PS04.5 Physical Science	Motion and Forces	Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. These effects help students to understand electric motors and generators.	164 166 166 168 170	what is an electromagnet? increased current vs. strength of magnetic field building an electromagnet how electric motors work dissecting an electric motor	66 67 68	build an electromagnet find out what happens to strength of electromagnet when current is increased investigate how an electric motor works

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PS05.1 Physical Science	Conservation of Energy and the Increase in Disorde	The total energy of the universe is constant. Energy can be transferred by collisions in chemical and nuclear reactions, by light waves and other radiations, and in many other ways. However, it can never be destroyed. As these transfers...	88 90 91 91 92 93 96	potential and kinetic energy explained conservation of energy explained understand basic forms of energy energy conversions energy transformations and conservation different forms of energy described prove that energy is conserved	37 38 38 39 119 147 188	investigating conservation of energy with rollercoaster explore energy transformations conservation of energy and energy transformations identify type of energy involved investigate temperature and energy transfer in melting process feel the heat generated by chemical reaction specific heat and conservation of energy
PS05.2 Physical Science	Conservation of Energy and the Increase in Disorde	All energy can be considered to be either kinetic energy, which is the energy of motion; potential energy, which depends on relative position; or energy contained by a field, such as electromagnetic waves.	88 90 92 93 96	potential and kinetic energy explained conservation of energy explained energy transformations and conservation different forms of energy described prove that energy is conserved	36 37 38 188	energy conservation and the roller coaster investigating conservation of energy with rollercoaster conservation of energy and energy transformations specific heat and conservation of energy

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PS05.3 Physical Science	Conservation of Energy and the Increase in Disorder	Heat consists of random motion and the vibrations of atoms, molecules, and ions. The higher the temperature, the greater the atomic or molecular motion.	455	temperature and thermal energy and heat	182	relationship between heat and temperature
PS05.4 Physical Science	Conservation of Energy and the Increase in Disorder	Everything tends to become less organized and less orderly over time. Thus, in all energy transfers, the overall effect is that the energy is spread out uniformly. Examples are the transfer of energy from hotter to cooler objects by ...	468 468 470 470 472 476 478 481	heat transfer through air densely packed solids are good conductors of heat convection currents and weather warming hands over candle convection currents in water solid road surface emits radiation apply knowledge of heat transfer to different situations global warming and heat transfer by radiation	190 192 194 194	investigate conduction through all states of matter investigate convection in liquids investigate radiation emitted by solids investigate radiation emitted by liquids

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

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Standard #: Content Area	Topic	Fundamental Concept	student text pg	detail	investigation pg	detail
			222	effect of temperature on speed of sound wave	102	polarization of water waves
			223	interference of sound waves	102	polarization of a spring wave
			225	consonance and dissonance and beats	103	polarization of light
			240	polarization of light	105	explore relationship between color and wavelength
			242	color and frequency of light waves	108	explore refraction with a prism
			242	properties of light waves		
			261	refraction and lenses		
			474	energy and radiation relationships		
			474	electromagnetic radiation		

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PS06.2 Physical Science	Interactions of Energy and Matter	Electromagnetic waves result when a charged object is accelerated or decelerated. Electromagnetic waves include radio waves (the longest wavelength), microwaves, infrared radiation (radiant heat), visible light, ultraviolet radiation...	196 237 237 237 237 250 272 474	waves are all around us visible light and the electromagnetic spectrum light waves and the electromagnetic spectrum microwave ovens radio and television signals identify uses of electromagnetic waves identify uses of electromagnetic waves ultraviolet and infrared light	134	investigating visible light with a spectrometer
PS06.3 Physical Science	Interactions of Energy and Matter	Each kind of atom or molecule can gain or lose energy only in particular discrete amounts and thus can absorb and emit light only at wavelengths corresponding to these amounts. These wavelengths can be used to identify the substance.	234 242 319	electrons and energy levels and light emission color and frequency of light waves fireworks displays and electron excitation	105 134 134 135	explore relationship between color and wavelength using a spectrometer what does atomic structure have to do with light and color? observing different light sources with a spectrometer

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PS06.4 Physical Science	Interactions of Energy and Matter	In some materials, such as metals, electrons flow easily, whereas in insulating materials such as glass they can hardly flow at all. Semiconducting materials have intermediate behavior. At low temperatures some materials become superconductors...	121	electrical conductivity explained	49	conductivity of aluminum vs. copper