

Correlation to Montana Standards for Science
Foundations of Physical Science Student Text and Investigation Manual

Standard #: Grade	Topic	Content Standard	Benchmark		Volume 1 Student Text page	Volume 2 Investigation Manual page	
INQ1.1 9-12	Inquiry	Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.	Generate a question, identify dependent and independent variables, formulate testable, multiple hypotheses, plan an investigation, predict its outcome, safely conduct the scientific investigations and collect and analyze data.	7	experimentation begins with a question	4	difference between precise and accurate data
				9	steps in the scientific method	6	electronic timer and release technique
				10	forming a hypothesis	6	formulate hypothesis
				11	control and experimental variables	7	design your own experiment
				12	importance of reliable and accurate data collection	7	record time interval
				19	design your own experiment	7	perform your own experiment
				19	design your own experiment	7	doing a controlled experiment
				20	finding variability in data	7	compare results with hypothesis
				24	interpretations of patterns in data	9	collect speed data
				26	independent and dependent variables	9	design three experiments using car and ramp
				27	reading a graph	9	devise a hypothesis
				42	devise an experiment	10	conduct car/ramp experiment
				78	analyze lever diagram	11	calculate % error
				79	look at force data and decide the usefulness of a machine	14	record three different time intervals
				372	observe chemical changes	15	interpret a speed vs. time graph
				500	safety rules described	16	decide how to vary the force on the car for this experiment
				501	safety quiz		

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
					16 investigate Newton's 2nd law 17 record times 18 use data to describe relationship between force and motion 19 use data to infer correct relationship between variables 21 choose independent and dependent variables for graph 24 collect weight data 25 collect force data 26 what variables can be changed? 27 write down the number of weights you use 27 recognize variables 30 interpret block and tackle data 34 formulate hypothesis 34 investigate motion on a rollercoaster 36 collect precise speed and height data 75 perform self-designed experiment

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
					75 plan three experiments to determine which variable affects the period of a pendulum
					75 collect mass and amplitude data
					75 design pendulum experiment
					76 calculate % error
					93 decision trees and the advantage of doing multiple trials
					100 observe glow-in-the-dark paper
					141 build models of Na and Cl and use them to explain bonding
					146 record detailed observations
					146 observe evidence of chemical change
					150 record data as you perform experiment
					151 design experiment to find out if mass is conserved
					158 observe temperature changes in chemical reactions
					164 observe Tyndall effect

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
					166 what three factors influence dissolving rate?
					166 devise hypothesis and explain
					166 which factor will produce fastest dissolving rate?
					167 collect time data and record observations
					168 observe dissolving process
					175 make observations about local surface water
					175 safety tip for testing local surface water
					178 formulate hypothesis
					192 observe convection currents
					198 formulate hypothesis

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INQ1.2 9-12	Inquiry	Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.	Select and use appropriate tools including technology to make measurements (in metric units), gather, process and analyze data from investigations using appropriate mathematical analysis, error analysis, and graphical representation.	5 measuring distance 6 scientists use metric units 11 controlling variables in experiments 12 scientific results must be repeatable 12 multiple experiment trials 19 did you run a controlled experiment? 20 what factors could explain the variability in their data? 24 making a graph 26 creating graphs 41 make a graph 42 analyze a speed/distance graph 288 find the thickness of a single card	data tables and graphs can be created on computer or graphing calculator 5 measuring metric and english lengths 6 compare results with other groups 6 measure time 7 what variables should be controlled? 9 conduct three experiments with appropriate equipment 9 design three experiments and choose technology 9 design three experiments and choose equipment 10 selecting ramp and photogates 11 calculate % error 11 graph speed vs. position 11 analyze speed change of car 12 select equipment and set up experiment 12 make metric length measurement

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
					13 graph distance vs. time
					14 record three different time intervals
					14 multiple trials
					15 construct a quantitative graphical model
					16 measure force
					18 study data table for relationship between force and motion
					21 think about percent change
					25 analyze block and tackle data
					25 collect force data
					27 write down the number of weights you use
					27 analyze lever equilibrium data
					30 rigging block and tackle
					35 does data support hypothesis?
					37 organize data into a graph of speed vs. height
					40 choose circuit parts to light a bulb
					44 measure voltage

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
					45 did battery voltage change?
					46 measure current
					48 measure resistance
					51 graph voltage vs. current
					63 perform multiple trials and average the results
					76 calculate % error
					76 analyze pendulum data
					87 measure wavelength
					116 measure mass
					117 measure volume
					121 graph mass vs. volume
					129 control the height of the liquid
					145 plan a procedure and select necessary equipment
					145 carry out procedure and select equipment
					146 record detailed observations
					147 organize observations into a category table
					147 students analyze chemical change lab results

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
					<p>150 record data as you perform experiment</p> <p>151 plan procedures and select materials</p> <p>151 select materials from list</p> <p>165 why was plain water tested?</p> <p>165 what does the word "control" mean?</p> <p>180 measure temperature</p> <p>181 construct a graphical model</p> <p>183 construct a temperature vs. time graph</p>

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INQ1.3 9-12	Inquiry	Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.	Review evidence, communicate and defend results, and recognize that the results of a scientific investigation are always open to revision by further investigations. (e.g. through graphical representation of charts)	10 process of reviewing hypothesis explained 19 which group did the best experiment?	18 evaluate graphs as to whether or not they show relationships between variables 21 evaluate percent change for data collected 35 what evidence is there in support of your hypothesis? 39 critique group's explanation of energy transformations 39 analyze energy transformations in different scenarios 39 review energy theory in context of everyday scenarios 75 evaluate statistical significance 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 101 how could you extend the investigation to explore materials that give off light when heated?

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
					<p>117 how could you find the volume of one drop of water?</p> <p>151 do the data support the hypothesis</p> <p>151 review your hypothesis</p> <p>167 evaluate method based on data</p> <p>167 did you prove or disprove your hypothesis?</p> <p>167 what was happening at molecular level?</p>

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INQ1.4 9-12	Inquiry	Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.	Analyze observations and explain with scientific understanding to develop a plausible model (e.g. atom, expanding universe)	20	finding variability in data	6	predict which car will move fastest
				24	making a graph	7	test the effect of one other variable
				24	interpretations of patterns in data	13	graph distance vs. time
				26	creating graphs	15	construct a quantitative graphical model
				27	reading a graph	15	interpret a speed vs. time graph
				41	make a graph	18	use data to describe relationship between force and motion
				78	analyze lever diagram	19	use data to infer correct relationship between variables
				79	look at force data and decide the usefulness of a machine	21	construct reasonable explanation based on data
				318	proton/electron attraction	27	think about the variables
				388	showing valence electrons in a diagram	30	interpret block and tackle data
						34	where does the marble move the fastest?
						35	study data and determine importance of height on speed of marble
						37	organize data into a graph of speed vs. height
						43	how did A and B tapes acquire different charge?

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
					45 analyze data and explain a rule
					51 graph voltage vs. current
					75 investigate variables that affect the period of a pendulum
					121 graph mass vs. volume
					132 building atom models
					136 model stable and neutral atoms
					140 find the number of electrons in outermost level
					141 build models of Na and Cl and use them to explain bonding
					147 organize observations into a category table
					151 perform the experiment you designed
					151 explain how hypothesis compares to results
					181 construct a graphical model
					183 construct a temperature vs. time graph

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INQ1.5 9-12	Inquiry	Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.	Identify strengths, weaknesses, and assess the validity of the experimental design of an investigation through analysis and evaluation	11	control and experimental variables	6	compare results with other groups
				12	scientific results must be repeatable	6	predict which car will move fastest
				12	multiple experiment trials	7	test the effect of one other variable
				19	which group did the best experiment?	7	doing a controlled experiment
				26	independent and dependent variables	11	graph speed vs. position
				42	analyze a speed/distance graph	11	analyze speed change of car
						11	calculate % error
						14	multiple trials
						18	evaluate graphs as to whether or not they show relationships between variables
						18	study data table for relationship between force and motion
						21	construct reasonable explanation based on data
						21	choose independent and dependent variables for graph
						21	evaluate percent change for data collected
		25	analyze block and tackle data				

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					27 recognize variables
					27 think about the variables
					27 analyze lever equilibrium data
					34 where does the marble move the fastest?
					35 does data support hypothesis?
					35 study data and determine importance of height on speed of marble
					43 how did A and B tapes acquire different charge?
					45 did battery voltage change?
					45 analyze data and explain a rule
					63 perform multiple trials and average the results
					75 investigate variables that affect the period of a pendulum
					75 evaluate statistical significance
					76 analyze pendulum data
					76 calculate % error

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					101 how could you extend the investigation to explore materials that give off light when heated?
					117 how could you find the volume of one drop of water?
					129 find average velocity
					147 students analyze chemical change lab results
					151 explain how hypothesis compares to results
					151 perform the experiment you designed
					157 add new rules to list based on findings
					167 evaluate method based on data
					167 average dissolving rate

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INQ1.6 9-12	Inquiry	Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.	explain how observations of nature form an essential base of knowledge among the Montana American Indians	34	Newton's research impacted mathematics	100	observe glow-in-the-dark paper
				73	impact of technology	146	observe evidence of chemical change
				320	the quests of alchemists	158	observe temperature changes in chemical reactions
				372	observe chemical changes	164	observe Tyndall effect
				391	scientific discovery and the atomic age	168	observe dissolving process
						174	visit local water supply and perform testing
						175	make observations about local surface water
						192	observe convection currents
						132	building atom models
						133	location of electrons in atom
PS2.1a 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Describe the structure of atoms, including knowledge of subatomic particles and their relative masses, charges, and locations within the atom	311	location/size/charge of subatomic particles	133	protons and neutrons
				311	protons/neutrons/electrons	136	model stable and neutral atoms
				318	proton/electron attraction	137	build atomic models
				388	showing valence electrons in a diagram	140	find the number of electrons in outermost level
						140	review subatomic particles

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PS2.1b 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Describe the structure of atoms, including knowledge of the electrical and nuclear forces that hold the atom together.	389	electromagnetic force	136	strong force
				389	strong nuclear force		
				389	forces in the nucleus		
PS2.1c 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Describe the structure of atoms, including the knowledge of fission and fusion.	387	fusion and fission explained	138	nuclear reactions
				388	nuclear vs chemical reactions	138	fusion and fission
				393	carbon dating	160	how do you simulate nuclear decay?
				393	radioisotopes in science and medicine	160	radioactive decay
				400	research pros and cons of nuclear technology	161	research pros and cons of uses for radioactive elements
PS2.1d 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Describe the structure of atoms, including the knowledge of radioactive decay.	316	isotopes explained	133	exploring isotopes
				343	mole quantities	136	understanding isotopes
				357	combustion reaction	144	show ratios in which elements combine to form a compound
				361	heartburn reaction	148	chemical equations
						160	radioactive decay

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PS2.2a 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Explain how the particulate level structure and properties of matter affect its macroscopic properties, including the effect of valance electrons on the chemical properties of the elements and the resulting periodic trends in these properties.	311	all matter is formed from atoms	132	atomic number determines what element that atom is
				315	atoms of same element have same atomic number	132	comparing atoms
				320	groups of elements	133	using the periodic table
				321	groups of elements and valence shells	137	importance of atomic number
				329	periodic table columns and valence electrons	141	build model of Na and Cl atoms and explain why they bond to form a molecule
				330	bonding and periodic table position	142	arrangement of electrons and groups of elements
				332	periodic table and electronegativities		
				332	metals nonmetals and metalloids		
			335	periodic table and oxidation numbers			

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PS2.2b 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Explain how the particulate level structure and properties of matter affect its macroscopic properties, including the effect of chemical bonding	321	groups of elements and valence shells	136	ions
				324	use the periodic table to predict chemical formulas	141	build model of Na and Cl atoms and explain why they bond to form a molecule
				324	which element is more likely to combine with other elements?	141	modeling a chemical bond
				329	periodic table columns and valence electrons	141	whan an atom ionizes
				330	Lewis Dot diagrams	142	arrangement of electrons and groups of elements
				330	ionic bonds	143	classify ionic compounds
				330	bonding and periodic table position		
				331	covalent bonds		
				332	distinguishing between ionic and covalent bonds		
				332	periodic table and electronegativities		
				335	periodic table and oxidation numbers		
				335	chemical bonding and the periodic table		

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PS2.2c 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Explain how the particulate level structure and properties of matter affect its macroscopic properties, including the effect of molecular geometry.	343	mole quantities	144	show ratios in which elements combine to form a compound
				364	carbon chains	162	carbon reactions and the environment
				421	a water molecule is v-shaped		
				421	water structure and its function as a solvent		
PS2.2d 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Explain how the particulate level structure and properties of matter affect its macroscopic properties, including the effect of kinetic molecular theory on phases of matter.	284	states of matter and arrangement of molecules	118	molecules in a liquid
				284	changes of state	118	investigate melting
				451	increasing temperature means increasing motion of molecules	118	think of melting process at molecular level
				451	temperature and kinetic energy	119	adding heat energy to melt an ice cube
				119	energy and phase changes		
PS2.2e 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Explain how the particulate level structure and properties of matter affect its macroscopic properties, including the effect of carbon-carbon atom bonding on biomolecules	364	carbon chains	162	carbon reactions and the environment
				394	photosynthesis and carbon reactions	162	structure of fossil fuels
				395	fossil fuels and carbon reactions	162	importance of fossil fuels

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PS2.3a 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Describe the major features associated with chemical reactions, including giving electricity and sound the characteristics of light, heat, motion, magnetism, electricity, sound and mechanical waves and examples important to industry and living organisms	357	combustion reaction	148	chemical equations
				361	chemical reactions in living systems	158	investigate energy changes in chemical reactions
				361	heartburn reaction		
				378	combustion reactions	158	measure energy changes in 3 different reactions
				378	consumer chemistry	162	investigating combustion reactions
				381	MRE ration heater reaction		
				381	exothermic reactions and MREs		
				382	endothermic reactions and cold packs		
				395	chemistry of the atmosphere		
				395	chemistry of the atmosphere		
				397	carbon reactions		
				444	chemical reactions and the formation of acid rain		
				487	chemical reactions in living systems		

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PS2.3b 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Describe the major features associated with chemical reactions, including energy changes associated with chemical changes	88	potential and kinetic energy explained	37	investigating conservation of energy with rollercoaster
				90	conservation of energy explained	38	explore energy transformations
				91	understand basic forms of energy	38	conservation of energy and energy transformations
				91	energy conversions	39	identify type of energy involved
				92	energy transformations and conservation	147	feel the heat generated by chemical reaction
				93	different forms of energy described	158	investigate energy changes in chemical reactions
				96	prove that energy is conserved	158	measure energy changes in 3 different reactions
				381	exothermic reactions and MREs	188	specific heat and conservation of energy
382	endothermic reactions and cold packs						

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PS2.3c 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Describe the major features associated with chemical reactions, including classes of chemical reactions.	354	chemical reactions and digestion	148	reactants and products
				359	balancing chemical equations	149	balance these equations
				364	formation of petroleum is a very slow chemical reaction	149	practice balancing equations
				371	which of the equations is balanced?	152	write the balanced equation
				375	synthesis or addition reactions	152	predict how much product formed given the reactants
				376	decomposition reactions	156	investigate double displacement reactions
				377	double displacement reactions	156	predict products in a double displacement reaction
				377	single displacement reactions	157	predict the products of double displacement reactions
				489	metabolism and stored energy		
PS2.3d 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Describe the major features associated with chemical reactions, including rates of reactions	364	formation of petroleum is a very slow chemical reaction	156	predict products in a double displacement reaction
						157	predict the products of double displacement reactions

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PS2.4 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Identify, measure, calculate, and analyze relationships associated with matter and energy transfer or transformations, and the associated conservation of mass	88	potential and kinetic energy explained	36	energy conservation and the roller coaster
				90	conservation of energy explained	37	investigating conservation of energy with rollercoaster
				91	energy conversions	38	conservation of energy and energy transformations
				92	energy transformations and conservation	38	explore energy transformations
				93	different forms of energy described	150	investigate conservation of mass in effervescent tablet reaction
				96	prove that energy is conserved	188	specific heat and conservation of energy
				363	history of law of conservation of mass		

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PS2.5a 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Explain the interactions between motions and forces, including the laws of motion.	45	Newton's third law summarized	14	exploring acceleration on a ramp
				45	Newton's second law summarized	16	unbalanced forces and acceleration of car
				45	Newton's first law summarized	16	thinking about force
				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	21	effect of friction on the car
				49	Newton's second law in detail	22	car and ramp and Newton's 3rd law
				51	net force explained	23	using 3rd law to explain common phenomena
				51	balanced and unbalanced forces		
				56	friction explained		
				59	Newton's third law in detail		
				64	research effect of friction on human joints		
				64	solving problems using $f=ma$		

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PS2.5b 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Explain the interactions between motions and forces including an understanding of the gravitational and electromagnetic forces	48	Newton's laws explained and applied	16	2nd law
				50	Newton's second law applied	20	force and motion with car and ramp
				52	gravity depends on mass	20	investigate effect of gravity on motion
				52	the effect of gravity	62	describing forces that magnets exert on each other
				54	Newton's law of universal gravitation	64	testing materials to see if they are affected by magnets
				55	calculating gravitational force between objects	66	compare electromagnets and permanent magnets
				106	electrical force is incredibly strong!	158	measure energy changes in 3 different reactions
				106	electrical forces		
				159	magnetism explained		
				163	understanding magnetic fields		

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PS2.6a 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Explain how energy is stored, transferred and transformed including the conservation of energy.	85	some input work is converted to heat	37	investigating conservation of energy with rollercoaster
				87	concept of energy as stored work	38	explore energy transformations
				88	potential and kinetic energy explained	38	conservation of energy and energy transformations
				90	conservation of energy explained	39	make an energy flow chart
				91	following an energy transformation	39	identify type of energy involved
				91	understand basic forms of energy	188	specific heat and conservation of energy
				91	energy conversions		
				92	where does "spent" energy go?		
				92	energy transformations and conservation		
				93	different forms of energy described		
				96	explain the "lost" energy		
				96	prove that energy is conserved		

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PS2.6b 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Explain how energy is stored, transferred and transformed including kinetic and potential energy and energy contained by a field.	159	magnetism explained	36	energy conservation and the roller coaster
				163	understanding magnetic fields	62	describing forces that magnets exert on each other
				164	what is an electromagnet?	64	testing materials to see if they are affected by magnets
				166	increased current vs. strength of magnetic field	66	compare electromagnets and permanent magnets
				166	building an electromagnet	66	build an electromagnet
				451	increasing temperature means increasing motion of molecules	67	find out what happens to strength of electromagnet when current is increased
				451	temperature and kinetic energy	119	adding heat energy to melt an ice cube
						119	investigate temperature and energy transfer in melting process

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PS2.6c 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Explain how energy is stored, transferred and transformed including heat energy and molecular motion.	451	temperature and kinetic energy	119	investigate temperature and energy transfer in melting process
				468	heat transfer through air	190	investigate conduction through all states of matter
				468	densely packed solids are good conductors of heat	190	investigate and rank materials for thermal conductivity
				469	thermal conductivity explained	192	investigate convection in liquids
				470	convection currents and weather	194	investigate radiation emitted by solids
				470	warming hands over candle	194	investigate radiation emitted by liquids
				472	convection currents in water		
				476	solid road surface emits radiation		
				478	apply knowledge of heat transfer to different situations		
				481	global warming and heat transfer by radiation		

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PS2.6d 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Explain how energy is stored, transferred and transformed including how energy tends to change from concentrated to diffuse.	84	work input and output	31	work output vs. work input
				85	some input work is converted to heat		
				92	where does "spent" energy go?		
				96	explain the "lost" energy		
				488	cooling processes and the human body		
				488	cooling processes and the human body		
				494	cooling processes and mechanical systems		
				494	cooling processes and mechanical systems		
PS2.7a 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Describe how matter and energy interact including waves.	219	frequency of sound and pitch	83	find speed of a wave
				220	voice recognition programs	86	adjust frequency of a standing wave
				220	white noise	90	investigate human perception of sound
				220	sonograms	90	what is sound and how do we hear it?
				221	importance of wavelength of sound waves	98	investigate sound and music
				226	musical instruments		
				474	electromagnetic radiation		

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page		
PS2.7b 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Describe how matter and energy interact including the electromagnetic spectrum.	196	waves are all around us	83	find speed of a wave
				221	importance of wavelength of sound waves	86	adjust frequency of a standing wave
				237	light waves and the electromagnetic spectrum		
				237	microwave ovens		
				237	radio and television signals		
				250	identify uses of electromagnetic waves		
				272	identify uses of electromagnetic waves		
PS2.7c 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Describe how matter and energy interact including the quantization of energy.	68	compound machines	29	design and construct complex gear machines
				96	decide whether or not work is done	31	work = force X distance
PS2.7d 9-12	Physical Science	Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	Describe how matter and energy interact including insulators and conductors.	294	development of Kevlar brand fiber	190	investigate and rank materials for thermal conductivity
469	thermal conductivity explained						

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page		Volume 2 Investigation Manual page
SH6.1 9-12	Science and History	Students understand historical developments in science and technology.	Analyze and illustrate the historical impact of scientific and technological advances, including Montana American Indian examples	34	Newton's research impacted mathematics	
				73	impact of technology	
				312	Dalton's contributions	
				320	the quests of alchemists	
				321	Mendeleev's periodic table	
				332	Linus Pauling and electronegativities	
				363	Antoine Lavoisier	
				391	scientific discovery and the atomic age	
				393	accomplishments of Marie Curie	
				393	Marie and Pierre Curie	
400	clean air act of 1970					

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page	
SH6.2 9-12	Science and History	Students understand historical developments in science and technology.	Trace developments that demonstrate scientific knowledge is subject to change as new evidence becomes available	34	Aristotle vs. Newton	6 asking questions and learning about natural world 130 investigate Rutherford's gold foil experiment 151 do the data support the hypothesis 157 add new rules to list based on findings 167 what was happening at molecular level?
				34	Newton and the history of physics	
				45	Newton's Laws of Motion	
				45	Newton's discovery of the 2nd law	
				46	oldest known standard weight	
				54	Newton and the force of gravity	
				105	Benjamin Franklin	
				107	Charles-Augustin Coulomb	
				134	history of superconductivity	
				161	history of magnetism	
				312	history of atomic theory	
				312	contributions of Fermi	
				313	development of atomic theory	
				321	contributions of Mendeleev	
				324	research and create a poster to illustrate development of atomic model	
				343	Avogadro's number	
				363	history of law of conservation of mass	

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				393 history of nuclear chemistry	
				393 contributions of Marie and Pierre Curie	
				400 research the Clean Air Act of 1970 and 1990	
				434 research local water supply history	
				464 research the history of heat and temperature	

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page		
SH6.3 9-12	Science and History	Students understand historical developments in science and technology.	Describe, explain, and analyze science as a human endeavor and an ongoing process	11	controlling variables in experiments	6	asking questions and learning about natural world
				12	scientific results must be repeatable	7	what variables should be controlled?
				12	multiple experiment trials	11	calculate % error
				19	did you run a controlled experiment?	14	multiple trials
				20	what factors could explain the variability in their data?	39	study energy transformations in daily life scenarios
				23	why make models?	63	perform multiple trials and average the results
				24	scientific models	76	calculate % error
				24	what is a scientific model?	129	control the height of the liquid
				58	Newton on a skateboard	157	add new rules to list based on findings
				78	describe a problem that would be solved by an engineer	163	evaluating choice of favorite car
				120	circuits in your house	165	what does the word "control" mean?
				214	ultrasound technology	165	why was plain water tested?
				220	voice recognition technology		
				294	invention of Kevlar		
				400	clean air act of 1970		

Correlation to Montana Standards for Science
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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page		Volume 2 Investigation Manual page	
STC5.1 9-12	Science Technology and Culture	Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.	Predict how key factors (e.g., technology, competitiveness, and world events) affect the development and acceptance of scientific thought	34	Aristotle vs. Newton	39	critique group's explanation of energy transformations
				45	Newton's Laws of Motion		
				54	Newton and the force of gravity	70	using engineering design cycle
				73	relationship between science and technology	77	show how energy loss data could be applied to designing a real clock
				105	Benjamin Franklin		
				107	Charles-Augustin Coulomb	177	research pH indicators
				135	circuit board explained	201	research electricity generation
				320	the quests of alchemists		
				391	scientific discovery and the atomic age		

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page		
STC5.2 9-12	Science Technology and Culture	Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.	Give examples of scientific innovation challenging commonly held perceptions	34	Newton's research impacted mathematics	130	investigate Rutherford's gold foil experiment
				34	Newton and the history of physics		
				45	Newton's discovery of the 2nd law		
				46	oldest known standard weight		
				73	impact of technology		
				134	history of superconductivity		
				161	history of magnetism		
				214	ultrasound technology		
				220	voice recognition technology		
				294	invention of Kevlar		
				312	history of atomic theory		
				312	contributions of Fermi		
				313	development of atomic theory		
				324	research and create a poster to illustrate development of atomic model		
				343	Avogadro's number		
363	history of law of conservation of mass						

Correlation to Montana Standards for Science

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
				393	
				contributions of Marie and Pierre Curie	
				393	
				history of nuclear chemistry	
				400	
				research the Clean Air Act of 1970 and 1990	
				434	
				research local water supply history	

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
STC5.3 9-12	Science Technology and Culture	Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.	Evaluate the ongoing, collaborative scientific process by gathering and critiquing information	10 process of reviewing hypothesis explained 110 study appliance labels and instructions 142 create pamphlet on utility's energy saver programs 333 problems with disposing of plastics 355 recycling tires 356 recycling discarded tires 364 petroleum 392 storage of nuclear waste 421 wise use of water 425 water cycle and conservation 430 water usage and quality 434 study claims made by bottled water companies	35 what evidence is there in support of your hypothesis? 39 analyze energy transformations in different scenarios 39 critique group's explanation of energy transformations 76 analyze watch manufacturer's claims 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 162 inferences from promotional materials for vehicles 163 can trees compensate for manmade CO2 from vehicles and industry? 163 consider a vehicle's fuel economy 167 did you prove or disprove your hypothesis? 172 perform water quality tests 172 save water for houseplants

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
					173 study water filtration device claims 174 wise use of water supply 175 maintaining water supply quality

Correlation to Montana Standards for Science
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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page	Volume 2 Investigation Manual page
STC5.4 9-12	Science Technology and Culture	Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.	Analyze benefits, limitations, costs, consequences, and ethics involved in using scientific and technological innovations (e.g., biotechnology, environmental issues)	368 limiting reactants 379 research fuel cells 379 research economic impact of fuel cells 379 hydrogen-powered cars and the environment 379 research fuel cells 379 research environmental impact of fuel cells 391 nuclear vs. fossil fuels 391 impact of nuclear energy 395 fossil fuels 400 reducing pollution 400 economic impact of pollution 400 economic impact of reducing air pollution 400 problems caused by airborne pollutants 444 impact of using fossil fuels 448 research economic impact of producing gases that cause acid rain	52 the cost of using electrical appliances 163 economic impact of end-product of combustion reaction 163 too much CO2 163 research how trees offset accumulation of CO2

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Standard #: Grade	Topic	Content Standard	Benchmark	Volume 1 Student Text page		Volume 2 Investigation Manual page	
STC5.5 9-12	Science Technology and Culture	Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.	Explain how the knowledge of science and technology applies to contemporary Montana American Indian communities (e.g., natural resources development, management and conservation)	135	circuit board explained	52	the cost of using electrical appliances
				172	generating electric power	163	consider a vehicle's fuel economy
				333	problems with disposing of plastics	163	can trees compensate for manmade CO2 from vehicles and industry?
				355	recycling tires	172	save water for houseplants
				356	recycling discarded tires	172	perform water quality tests
				364	petroleum	174	wise use of water supply
				391	impact of nuclear energy	175	maintaining water supply quality
				392	storage of nuclear waste		
				400	reducing pollution		
				421	wise use of water		
				425	water cycle and conservation		
430	water usage and quality						