

**Correlation to Arkansas Science Curriculum Framework 2005**  
**Foundations of Physical Science Student Text and Investigation Manual**

Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page		
C.01.PS.01 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Compare and contrast chemical and physical properties of matter, including but not limited to flammability, reactivity, density, buoyancy, viscosity, melting point and boiling point	284	melting and boiling point explained	116	mass and volume measurements
				284	melting and boiling points	119	melting point of ice
				285	table of melting and boiling points	124	build a density column
				291	density explained	126	investigating buoyancy with clay boats
				291	density is independent of amount of substance	128	use CPO viscometer to study viscosity
				292	hardness is a physical property of matter		
				292	elasticity is a physical property of matter		
				293	brittleness is a physical property of matter		
				294	malleability is a physical property of matter		
				294	tensile strength is a physical property of matter		
				295	relationship between mass volume and density		
				296	density of liquid water vs. ice		
				297	buoyancy explained		
				298	sinking and floating		
				302	viscosity of motor oils		
				305	viscosity of glue mixtures		

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
C.01.PS.02 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Compare and contrast chemical and physical changes, including but not limited to rusting, burning, evaporation, boiling and dehydration	284 changes of state 353 physical and chemical changes and digestion 355 physical and chemical changes in tire recycling 357 combustion reaction 361 chemical reactions in living systems 361 heartburn reaction 372 determine if changes are chemical or physical 378 combustion reactions 378 consumer chemistry 381 MRE ration heater reaction 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	119 create a temperature vs. time graph of phase change 119 energy and phase changes 146 investigate and observe chemical and physical changes in the lab 162 investigating combustion reactions

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page		
C.01.PS.03 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Discuss and model the relative size and placement of sub-atomic particles	311	location/size/charge of subatomic particles	132	atomic number determines what element that atom is
				311	protons/neutrons/electrons	132	building atom models
				315	atomic number discussed	133	identify mass number
				315	atoms of same element have same atomic number	133	identify atomic number
				316	mass number discussed	133	identify element symbol and name
				318	proton/electron attraction	133	location of electrons in atom
				322	atomic mass on the periodic table	133	protons and neutrons
				322	mass number on the periodic table	136	mass number
				322	atomic number on the periodic table	136	atomic number
				322	chemical symbols and element names	136	model stable and neutral atoms
				388	showing valence electrons in a diagram	137	importance of atomic number
						137	build atomic models
						140	find the number of electrons in outermost level
		140	review subatomic particles				

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
C.01.PS.04 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Illustrate the placement of electrons in the first twenty elements using energy levels and orbitals	324 use the periodic table to predict chemical formulas 324 which element is more likely to combine with other elements? 335 chemical bonding and the periodic table 388 showing valence electrons in a diagram	136 ions 140 find the number of electrons in outermost level 141 when an atom ionizes 141 modeling a chemical bond
C.01.PS.05 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Distinguish among atoms, ions, and isotopes	315 atomic number discussed 316 mass number discussed 316 isotopes explained 322 atomic mass on the periodic table 322 mass number on the periodic table 322 atomic number on the periodic table 322 chemical symbols and element names	133 identify mass number 133 identify atomic number 133 identify element symbol and name 133 exploring isotopes 136 mass number 136 atomic number 136 understanding isotopes 136 ions 141 when an atom ionizes
C.01.PS.06 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Model the valence electrons using electron dot structures (Lewis electron dot structures)	330 Lewis Dot diagrams 388 showing valence electrons in a diagram	140 find the number of electrons in outermost level

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
C.01.PS.07 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Explain the role of valence electrons in determining chemical properties	321 groups of elements and valence shells 324 use the periodic table to predict chemical formulas 324 which element is more likely to combine with other elements? 329 periodic table columns and valence electrons 330 bonding and periodic table position 332 periodic table and electronegativities 335 periodic table and oxidation numbers 335 chemical bonding and the periodic table	141 build model of Na and Cl atoms and explain why they bond to form a molecule 141 modeling a chemical bond 142 arrangement of electrons and groups of elements
C.01.PS.08 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Explain the role of valence electrons in forming chemical bonds	324 use the periodic table to predict chemical formulas 324 which element is more likely to combine with other elements? 335 chemical bonding and the periodic table	141 modeling a chemical bond

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
C.01.PS.09 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Model bonding: •ionic •covalent •metallic	330 ionic bonds 331 covalent bonds 332 distinguishing between ionic and covalent bonds 336 writing a chemical formula 338 summary of chemical formula writing rules	143 classify ionic compounds 143 predict chemical formulas 143 ionic compounds 145 determine empirical formula
C.01.PS.10 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Identify commonly used polyatomic ions	337 polyatomic ions	
C.01.PS.11 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Write formulas for ionic and covalent compounds	330 ionic bonds 331 covalent bonds 332 distinguishing between ionic and covalent bonds 336 writing a chemical formula 338 summary of chemical formula writing rules	143 classify ionic compounds 143 predict chemical formulas 145 determine empirical formula
C.01.PS.12 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Name ionic and covalent compounds	330 ionic bonds 331 covalent bonds 332 distinguishing between ionic and covalent bonds 339 naming compounds	143 classify ionic compounds 143 name chemical compounds

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
C.01.PS.13 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Identify the mole and amu (atomic mass unit) as units of measurement in chemistry	343 what is a mole?	
C.01.PS.14 Physical Science	Chemistry	Students shall demonstrate an understanding of matter's composition and structure.	Calculate the molar mass of compounds based on average atomic mass.	344 calculating formula mass 349 calculate the formula mass	
C.02.PS.01 Physical Science	Chemistry	Students shall demonstrate an understanding of the role of energy in chemistry.	Identify the kinetic theory throughout the phases of matter	284 states of matter and arrangement of molecules 451 temperature and kinetic energy	118 molecules in a liquid 118 investigate melting
C.02.PS.02 Physical Science	Chemistry	Students shall demonstrate an understanding of the role of energy in chemistry.	Create and label heat versus temperature graphs (heating curves):  <ul style="list-style-type: none"> <li>•solid</li> <li>•liquid</li> <li>•gas</li> <li>•triple point</li> <li>•heat of fusion</li> <li>•heat of vaporization</li> </ul>		119 create a temperature vs. time graph of phase change
C.02.PS.03 Physical Science	Chemistry	Students shall demonstrate an understanding of the role of energy in chemistry.	Relate thermal expansion to the kinetic theory	300 what is pressure? 451 temperature and kinetic energy	

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
C.02.PS.04 Physical Science	Chemistry	Students shall demonstrate an understanding of the role of energy in chemistry.	Compare and contrast Boyle's law and Charles' law	299 Charles' law 300 Boyle's law	
C.02.PS.05 Physical Science	Chemistry	Students shall demonstrate an understanding of the role of energy in chemistry.	Compare and contrast endothermic and exothermic reactions as energy is transferred	381 exothermic reactions and MREs 382 endothermic reactions and cold packs	158 investigate energy changes in chemical reactions 158 measure energy changes in 3 different reactions
C.02.PS.06 Physical Science	Chemistry	Students shall demonstrate an understanding of the role of energy in chemistry.	Distinguish between nuclear fission and nuclear fusion	387 fusion and fission explained	138 fusion and fission
C.02.PS.07 Physical Science	Chemistry	Students shall demonstrate an understanding of the role of energy in chemistry.	Compare and contrast the emissions produced by radioactive decay:  •alpha particles •beta particles •gamma rays	388 nuclear vs chemical reactions	138 nuclear reactions 160 how do you simulate nuclear decay? 160 radioactive decay

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
C.03.PS.01 Physical Science	Chemistry	Students shall compare and contrast chemical reactions.	Identify and write balanced chemical equations: <ul style="list-style-type: none"> <li>•decomposition reaction</li> <li>•synthesis reaction</li> <li>•single displacement reaction</li> <li>•double displacement reaction</li> <li>•combustion reaction</li> </ul>	371 which of the equations is balanced? 375 synthesis or addition reactions 376 decomposition reactions 377 double displacement reactions 377 single displacement reactions	149 balance these equations 156 investigate double displacement reactions
C.03.PS.02 Physical Science	Chemistry	Students shall compare and contrast chemical reactions.	Predict the product(s) of a chemical reaction when given the reactants using chemical symbols and words	336 writing chemical formulas 368 predicting amount of product	155 calculating product yield
C.03.PS.03 Physical Science	Chemistry	Students shall compare and contrast chemical reactions.	Balance chemical equations using the Law of Conservation of Mass	371 which of the equations is balanced?	149 balance these equations 150 investigate conservation of mass in effervescent tablet reaction
C.03.PS.04 Physical Science	Chemistry	Students shall compare and contrast chemical reactions.	Determine mole ratio from a balanced reaction equation	343 what is a mole?	

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
C.03.PS.05 Physical Science	Chemistry	Students shall compare and contrast chemical reactions.	Compare and contrast the properties of reactants and products of a chemical reaction	354 new substances are formed when a chemical change occurs  359 balancing chemical equations	148 reactants and products 149 practice balancing equations 152 write the balanced equation 152 predict how much product formed given the reactants
C.03.PS.06 Physical Science	Chemistry	Students shall compare and contrast chemical reactions.	Model the role of activation energy in chemical reactions	381 exothermic reactions and MREs 382 endothermic reactions and cold packs	158 investigate energy changes in chemical reactions
C.03.PS.07 Physical Science	Chemistry	Students shall compare and contrast chemical reactions.	Examine factors that affect the rate of chemical reactions, including but not limited to temperature, light, concentration, catalysts, surface area, pressure	364 formation of petroleum is a very slow chemical reaction	156 predict products in a double displacement reaction
C.03.PS.08 Physical Science	Chemistry	Students shall compare and contrast chemical reactions.	Identify the observable evidence of a chemical reaction:  <ul style="list-style-type: none"> <li>•formation of a precipitate</li> <li>•production of a gas</li> <li>•color change</li> <li>•changes in heat and light</li> </ul>	353 physical and chemical changes and digestion 355 physical and chemical changes in tire recycling 372 determine if changes are chemical or physical	146 investigate and observe chemical and physical changes in the lab

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C.03.PS.09 Physical Science	Chemistry	Students shall compare and contrast chemical reactions.	Relate fire safety measures to conditions necessary for combustion	357 combustion reaction 361 heartburn reaction	
C.04.PS.01 Physical Science	Chemistry	Students shall classify organic compounds.	Summarize carbon bonding:  <ul style="list-style-type: none"> <li>•allotropes (diamond, graphite, fullerenes)</li> <li>•carbon-carbon (single, double, triple)</li> <li>•isomers (branched, straight-chain, ring)</li> </ul>	364 carbon chains	162 carbon reactions and the environment
C.04.PS.02 Physical Science	Chemistry	Students shall classify organic compounds.	Identify organic compounds by their:  <ul style="list-style-type: none"> <li>•formula</li> <li>•structure</li> <li>•properties</li> <li>•functional groups</li> </ul>	364 carbon chains 487 simple sugars are transported to cells 487 biomolecules and energy 488 fats proteins and carbohydrates	162 carbon reactions and the environment
C.04.PS.03 Physical Science	Chemistry	Students shall classify organic compounds.	Distinguish between saturated and unsaturated hydrocarbons	364 carbon chains	162 carbon reactions and the environment
C.04.PS.04 Physical Science	Chemistry	Students shall classify organic compounds.	Describe organic compounds and their functions in the human body:  <ul style="list-style-type: none"> <li>•carbohydrates</li> <li>•lipids</li> <li>•proteins</li> <li>•nucleic acids</li> </ul>	487 simple sugars are transported to cells 487 biomolecules and energy 488 fats proteins and carbohydrates	

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NS.09.PS.01 Physical Science	Nature of Science	Students shall demonstrate an understanding that science is a way of knowing.	Explain why science is limited to natural explanations of how the world works	23 why make models? 24 scientific models 24 what is a scientific model?	6 asking questions and learning about natural world
NS.09.PS.02 Physical Science	Nature of Science	Students shall demonstrate an understanding that science is a way of knowing.	Compare and contrast hypotheses, theories, and laws		6 formulate hypothesis 9 devise a hypothesis 34 formulate 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 166 devise hypothesis and explain 178 formulate hypothesis 198 formulate hypothesis

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
NS.09.PS.03 Physical Science	Nature of Science	Students shall demonstrate an understanding that science is a way of knowing.	Distinguish between a scientific theory and the term "theory" used in general conversation		<p>39 critique group's explanation of energy transformations</p> <p>39 review energy theory in context of everyday scenarios</p> <p>39 analyze energy transformations in different scenarios</p> <p>77 show how energy loss data could be applied to designing a real clock</p> <p>77 compare law of conservation of energy to motion of pendulum</p>

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NS.09.PS.04 Physical Science	Nature of Science	Students shall demonstrate an understanding that science is a way of knowing.	Summarize the guidelines of science: <ul style="list-style-type: none"> <li>•explanations</li> <li>•hypotheses must be testable</li> <li>•understandings and/or conclusions may change</li> <li>•scientific knowledge must have peer review</li> </ul>	12 scientific results must be repeatable 12 multiple experiment trials	6 formulate hypothesis 6 predict which car will move fastest 7 variables in an experiment 7 test the effect of one other variable 9 devise a hypothesis 14 multiple trials 27 think about the variables 34 formulate hypothesis 34 where does the marble move the fastest? 43 how did A and B tapes acquire different charge? 63 perform multiple trials and average the results 75 investigate variables that affect the period of a pendulum 151 perform the experiment you designed 151 explain how hypothesis compares to results 157 add new rules to list based on findings 166 devise hypothesis and explain

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<b>Standard #: Course Title</b>	<b>Strand</b>	<b>Standard</b>	<b>Learning Expectation</b>	<b>Volume 1 Student Text page</b>	<b>Volume 2 Investigation Manual page</b>
					178 formulate hypothesis 198 formulate hypothesis
NS.10.PS.01 Physical Science	Nature of Science	Students shall design and safely conduct a scientific inquiry to solve valid problems.	Develop and explain the appropriate procedure, controls, and variables (dependent and independent) in scientific experimentation	11 control and experimental variables 26 independent and dependent variables	7 doing a controlled experiment 21 choose independent and dependent variables for graph 27 recognize variables

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
NS.10.PS.02 Physical Science	Nature of Science	Students shall design and safely conduct a scientific inquiry to solve valid problems.	Research and apply appropriate safety precautions (refer to ADE Guidelines) when designing and/or conducting scientific investigations	500 safety rules described 501 safety quiz	20 safety tip for car/ramp setup 24 ropes and pulley safety 26 safety tip for hanging weights from lever 40 electrical safety 44 short circuit safety warning 56 short circuit safety warning 58 short circuit safety warning 146 safety in the lab 150 chemistry safety 158 wear goggles and apron 164 safety equipment 168 hot water safety 172 safety tip for water testing 180 thermometer safety 182 heat safety 186 thermometer safety 192 heat safety 198 heat safety 200 safely using rubber bands

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page		
NS.10.PS.03 Physical Science	Nature of Science	Students shall design and safely conduct a scientific inquiry to solve valid problems.	Identify sources of bias that could affect experimental outcome	11	control and experimental variables	6	predict which car will move fastest
				26	independent and dependent variables	7	test the effect of one other variable
				28	identifying cause and effect relationships	7	doing a controlled experiment
				41	identify cause and effect	21	choose independent and dependent variables for graph
				372	observe chemical changes	21	determine effect of increasing mass
						27	recognize variables
						27	think about the variables
						34	where does the marble move the fastest?
						43	how did A and B tapes acquire different charge?
						75	investigate variables that affect the period of a pendulum
		100	observe glow-in-the-dark paper				
		146	observe evidence of chemical change				
		151	perform the experiment you designed				
		151	explain how hypothesis compares to results				

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
					<p>157 add new rules to list based on findings</p> <p>158 observe temperature changes in chemical reactions</p> <p>164 observe Tyndall effect</p> <p>168 observe dissolving process</p> <p>175 make observations about local surface water</p> <p>192 observe convection currents</p>

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NS.10.PS.04 Physical Science	Nature of Science	Students shall design and safely conduct a scientific inquiry to solve valid problems.	Gather and analyze data using appropriate summary statistics	5	measuring distance	5	measuring metric and english lengths
				11	controlling variables in experiments	6	measure time
				19	did you run a controlled experiment?	6	compare results with other groups
				20	what factors could explain the variability in their data?	7	what variables should be controlled?
				24	making a graph	11	graph speed vs. position
				24	interpretations of patterns in data	11	calculate % error
				26	creating graphs	11	analyze speed change of car
				27	reading a graph	13	graph distance vs. time
				41	make a graph	15	interpret a speed vs. time graph
				42	analyze a speed/distance graph	15	construct a quantitative graphical model
				78	analyze lever diagram	16	measure force
						18	study data table for relationship between force and motion
						25	analyze block and tackle data
		27	analyze lever equilibrium data				
		35	does data support hypothesis?				
		37	organize data into a graph of speed vs. height				

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
					44 measure voltage
					45 did battery voltage change?
					46 measure current
					48 measure resistance
					51 graph voltage vs. current
					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
					129 find average velocity
					147 students analyze chemical change lab results
					147 organize observations into a category table
					151 does your experiment agree with law of conservation of mass?
					165 why was plain water tested?
					165 what does the word "control" mean?

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					167 average dissolving rate 180 measure temperature 181 construct a graphical model 183 construct a temperature vs. time graph
NS.10.PS.05 Physical Science	Nature of Science	Students shall design and safely conduct a scientific inquiry to solve valid problems.	Formulate valid conclusions without bias	20 how will speed change? 24 predicting speed from a graph 42 predict the speed of a car	21 think about percent change 21 construct reasonable explanation based on data 35 study data and determine importance of height on speed of marble 45 analyze data and explain a rule 76 use data to predict best string length for a pendulum clock 121 use graph to predict mass of six objects 151 do the data support the hypothesis 156 make predictions about solubility 167 what was happening at molecular level?

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NS.10.PS.06 Physical Science	Nature of Science	Students shall design and safely conduct a scientific inquiry to solve valid problems.	Communicate experimental results using appropriate reports, figures, and tables	20	explain your reasoning	9	construct a data table
				24	making a graph	9	present conclusions to the class
				26	creating graphs	9	reporting on an experiment
				41	make a graph	12	understand and use data table
						13	graph distance vs. time
						13	make a distance vs. time graph
						15	construct a quantitative graphical model
						15	discuss and test ideas with your group
						17	record results in data table
						18	organize different combinations of data
						19	explain how you arrived at your answer
						24	use data table to record results
						27	use data table to record results
		29	discuss what you learned about gears				
		30	record ropes and pulley data in table				
		36	organize data into a table				

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					37 describe the flow of energy based on experimental graph
					37 organize data into a graph of speed vs. height
					39 give a brief presentation to the class
					47 present and defend an explanation
					47 discuss an explanation with your group
					51 graph voltage vs. current
					75 create data table for self-designed experiment
					121 graph mass vs. volume
					129 explain your answer and justify
					145 present findings and methods used
					147 organize observations into a category table
					151 design a data table
					151 present results to the class
					167 use data table for observations
					173 write prargraph to explain results

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					173 organize water quality data into a table 175 create water quality report 179 write summary of findings 181 construct a graphical model 183 construct a temperature vs. time graph
NS.11.PS.01 Physical Science	Nature of Science	Students shall demonstrate an understanding of historical trends in physical science.	Recognize the factors that constitute a scientific theory		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
NS.11.PS.02 Physical Science	Nature of Science	Students shall demonstrate an understanding of historical trends in physical science.	Explain why scientific theories may be modified or expanded using additional empirical data, verification, and peer review	12 scientific results must be repeatable 12 multiple experiment trials	14 multiple trials 63 perform multiple trials and average the results 157 add new rules to list based on findings

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NS.11.PS.03 Physical Science	Nature of Science	Students shall demonstrate an understanding of historical trends in physical science.	Summarize the development of the current atomic theory	313 development of atomic theory 324 research and create a poster to illustrate development of atomic model	130 investigate Rutherford's gold foil experiment
NS.11.PS.04 Physical Science	Nature of Science	Students shall demonstrate an understanding of historical trends in physical science.	Analyze the development of the periodic table	321 contributions of Mendeleev	

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NS.11.PS.05 Physical Science	Nature of Science	Students shall demonstrate an understanding of historical trends in physical science.	Research historical events in physical science	34 Newton and the history of physics 45 Newton's discovery of the 2nd law 46 oldest known standard weight 134 history of superconductivity 161 history of magnetism 312 history of atomic theory 343 Avogadro's number 363 history of law of conservation of mass 393 history of nuclear chemistry 400 research the Clean Air Act of 1970 and 1990 434 research local water supply history	
NS.11.PS.06 Physical Science	Nature of Science	Students shall demonstrate an understanding of historical trends in physical science.	Research current events and topics in physical science	73 relationship between science and technology	70 using engineering design cycle

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NS.12.PS.01 Physical Science	Nature of Science	Students shall use mathematics, science equipment, and technology as tools to communicate and solve physical science problems.	Use appropriate equipment and technology as tools for solving problems (e.g., balances, scales, calculators, probes, glassware, burners, computer software and hardware)	5 measuring distance 24 using an electronic timer	data tables and graphs can be created on computer or graphing calculator  5 measuring metric and english lengths 6 measure time 7 use a ruler to make a measurement  12 using photogates 14 using photogates 16 use a force scale 16 measure force 17 use photogates to study car on ramp 18 use a balance to find mass of car  30 use force scale 44 using electrical meter 44 measure voltage 46 using electrical meter 46 measure current 48 using electrical meter 48 measure resistance 50 using electrical meter

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					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 180 measure temperature

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NS.12.PS.02 Physical Science	Nature of Science	Students shall use mathematics, science equipment, and technology as tools to communicate and solve physical science problems.	Collect and analyze scientific data using appropriate mathematical calculations, figures, and tables	5 12 20 24 42 42	measuring distance importance of reliable and accurate data collection how will speed change? predicting speed from a graph predict the speed of a car interpreting distance/time graph	4 4 5 6 6 7 7 9 16 17 21 24 25 27 28 36 44 46 48 75	difference between precise and accurate data measuring metric and english lengths measure time electronic timer and release technique record time interval collect speed data measure force record times think about percent change collect weight data create a mathematical model find math rule for lever equilibrium derive a math formula collect precise speed and height data measure voltage measure current measure resistance collect mass and amplitude data

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Standard #: Course Title	Strand	Standard	Learning Expectation	Volume 1 Student Text page	Volume 2 Investigation Manual page
					76 use data to predict best string length for a pendulum clock 87 measure wavelength 116 measure mass 117 measure volume 121 use graph to predict mass of six objects 129 find average velocity 156 make predictions about solubility 167 average dissolving rate 167 collect time data and record observations 180 measure temperature
NS.12.PS.03 Physical Science	Nature of Science	Students shall use mathematics, science equipment, and technology as tools to communicate and solve physical science problems.	Utilize technology to communicate research findings		data tables and graphs can be created on computer or graphing calculator
NS.13.PS.01 Physical Science	Nature of Science	Students shall describe the connections between pure and applied science.	Compare and contrast physical science concepts in pure science and applied science	73 relationship between science and technology	70 using engineering design cycle

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NS.13.PS.02 Physical Science	Nature of Science	Students shall describe the connections between pure and applied science.	Discuss why scientists should work within ethical parameters	45 55 73 86 110 115 131 160 312 321 332 363 370 393 393 456	Newton's Principia Newton and the apple legend Leonardo DaVinci James Watt research Franklin's electricity experiments Volta's batteries Georg Ohm's work with circuits Faraday's contributions Dalton's contributions Mendeleev's periodic table Linus Pauling and electronegativities Antoine Lavoisier research Lavoisier's contributions accomplishments of Marie Curie Marie and Pierre Curie contributions of Joule	

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NS.13.PS.03 Physical Science	Nature of Science	Students shall describe the connections between pure and applied science.	Evaluate long-range plans concerning resource use and by-product disposal for environmental, economic, and political impact	333	problems with disposing of plastics	163	economic impact of end-product of combustion reaction
				355	recycling tires	163	too much CO <sub>2</sub>
				356	recycling discarded tires	163	consider a vehicle's fuel economy
				364	petroleum	163	research how trees offset accumulation of CO <sub>2</sub>
				368	limiting reactants	163	can trees compensate for manmade CO <sub>2</sub> from vehicles and industry?
				379	research economic impact of fuel cells	172	save water for houseplants
				379	research environmental impact of fuel cells	172	perform water quality tests
				379	research fuel cells	174	wise use of water supply
				379	hydrogen-powered cars and the environment	175	maintaining water supply quality
				379	research fuel cells	178	investigate effect of acid rain on microorganisms
				392	storage of nuclear waste		
				395	fossil fuels		
				400	economic impact of reducing air pollution		
				400	problems caused by airborne pollutants		
				400	economic impact of pollution		
				421	wise use of water		
				425	water cycle and conservation		
				430	water usage and quality		

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				444 acid rain explained 448 research the issue of acid rain 448 research economic impact of producing gases that cause acid rain	
NS.13.PS.04 Physical Science	Nature of Science	Students shall describe the connections between pure and applied science.	Explain how the cyclical relationship between science and technology results in reciprocal advancements in science and technology	73 relationship between science and technology 74 sample engineering problem	70 using engineering design cycle 70 designing and testing different electric motors 70 proposing and comparing different electric motor designs 71 testing a motor for performance 71 did draining the batteries affect motor speed? 71 which motor gave the highest speed and why?
NS.13.PS.05 Physical Science	Nature of Science	Students shall describe the connections between pure and applied science.	Describe in detail the methods used by scientists in their research	12 scientific results must be repeatable 12 multiple experiment trials	7 variables in an experiment 14 multiple trials 63 perform multiple trials and average the results

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NS.14.PS.01 Physical Science	Nature of Science	Students shall describe various physical science careers and the training required for the selected career.	Research and evaluate physical science careers using the following criteria: <ul style="list-style-type: none"> <li>•educational requirements</li> <li>•salary</li> <li>•availability of jobs</li> <li>•working conditions</li> </ul>		174 water quality testing 177 chemistry and photography
P.05.PS.01 Physical Science	Physics	Students shall demonstrate an understanding of the role of energy in physics.	Distinguish among thermal energy, heat, and temperature	455 temperature and thermal energy and heat	119 investigate temperature and energy transfer in melting process 182 relationship between heat and temperature
P.05.PS.02 Physical Science	Physics	Students shall demonstrate an understanding of the role of energy in physics.	Calculate changes in thermal energy	452 temperature scales 457 specific heat and the heat equation 458 specific heat 459 specific heat of different substances	119 investigate temperature and energy transfer in melting process
P.06.PS.01 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Analyze how force affects motion: <ul style="list-style-type: none"> <li>•one-dimensional (linear)</li> <li>•two-dimensional (projectile and rotational)</li> </ul>	46 force has potential to change motion 49 force is related to acceleration 51 balanced and unbalanced forces 52 the effect of gravity	16 unbalanced forces and acceleration of car 19 find correct relationship between force mass and acceleration 20 investigate effect of gravity on motion

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P.06.PS.02 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Explain how motion is relative to a reference point	13 18 25	speed is relative what is the speed of an object that is standing still? conceptual models of motion		
P.06.PS.03 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Compare and contrast among speed, velocity and acceleration	15 32 33 36	compare and contrast speed and velocity average speed discussed understanding acceleration examples of acceleration	8	calculating speed
P.06.PS.04 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Solve problems using the formulas for speed and acceleration:	14 20 20 24 32 35 41 42 49 53	how to calculate speed calculate speed of car find speed of bumblebee accurate speed measurements average speed vs. instantaneous how to calculate acceleration find acceleration of car calculate speed from distance/time graph link between force and acceleration acceleration due to gravity	9 10 12 12 14 14 17 17 36	collect data and calculate speed of car calculate speed of the car find speed of car at different positions calculate speed of moving car calculate speed of car at two places on the ramp calculate acceleration of car on ramp calculate speed of car explore 2nd law and acceleration find speed of marble

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P.06.PS.05 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Interpret graphs related to motion: <ul style="list-style-type: none"> <li>•distance versus time (d-t)</li> <li>•velocity versus time (v-t)</li> <li>•acceleration versus time (a-t)</li> </ul>	30 37	position vs. time graphs speed vs. time graphs	13 15	make a position vs. time graph make a speed vs. time graph
P.06.PS.06 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Compare and contrast Newton's three laws of motion	45 45 45 48 49 59 64	Newton's third law summarized Newton's second law summarized Newton's first law summarized Newton's first law in detail Newton's second law in detail Newton's third law in detail solving problems using $f=ma$	14 16 19 22 23	exploring acceleration on a ramp thinking about force discover 2nd law of motion car and ramp and Newton's 3rd law using 3rd law to explain common phenomena
P.06.PS.07 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Design and conduct investigations demonstrating Newton's first law of motion	45 48	Newton's first law summarized Newton's first law in detail	14	exploring acceleration on a ramp

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P.06.PS.08 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Conduct investigations demonstrating Newton's second law of motion	45 Newton's second law summarized 49 Newton's second law in detail 64 solving problems using $f=ma$	16 thinking about force 19 discover 2nd law of motion
P.06.PS.09 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Design and conduct investigations demonstrating Newton's third law of motion	45 Newton's third law summarized 59 Newton's third law in detail	22 car and ramp and Newton's 3rd law 23 using 3rd law to explain common phenomena
P.06.PS.10 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Calculate force, mass, and acceleration using Newton's second law of motion:	64 solving problems using $f=ma$	19 discover 2nd law of motion
P.06.PS.11 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Relate the Law of Conservation of Momentum to how it affects the movement of objects	60 law of conservation of momentum	
P.06.PS.12 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Compare and contrast the effects of forces on fluids:  •Archimedes' principle •Pascal's principle •Bernoulli's principle	297 buoyancy explained 298 sinking and floating	126 investigating buoyancy with clay boats

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P.06.PS.13 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Design an experiment to show conversion of energy:  <ul style="list-style-type: none"> <li>•mechanical (potential and kinetic)</li> <li>•chemical</li> <li>•thermal</li> <li>•sound</li> <li>•light</li> <li>•nuclear</li> </ul>	91	following an energy transformation	36	energy conservation and the roller coaster
				91	understand basic forms of energy	38	identify potential/kinetic energy conversions
				91	energy conversions	38	explore energy transformations
						39	identify type of energy involved
P.06.PS.14 Physical Science	Physics	Students shall demonstrate an understanding of the role of forces in physics.	Solve problems by using formulas for gravitational potential and kinetic energy:	91	following an energy transformation	38	identify potential/kinetic energy conversions
P.07.PS.01 Physical Science	Physics	Students shall demonstrate an understanding of wave and particle motion.	Compare and contrast a wave's speed through various mediums	221	importance of wavelength of sound waves	83	find speed of a wave
						86	adjust frequency of a standing wave
P.07.PS.02 Physical Science	Physics	Students shall demonstrate an understanding of wave and particle motion.	Explain diffraction of waves	237	visible light and the electromagnetic spectrum	101	observing white light through diffraction grating
						101	examine light through diffraction grating
						134	investigating visible light with a spectrometer

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P.07.PS.03 Physical Science	Physics	Students shall demonstrate an understanding of wave and particle motion.	Explain Doppler effect using examples	197 transverse and longitudinal waves 204 resonance explained 205 standing waves on a string 210 natural frequency of a building and earthquakes 240 polarization of light	82 study wave pulses on elastic cord 84 make different types of waves in a ripple tank 87 investigating resonance 88 natural frequency and resonance of standing waves on a string 96 investigating sound resonance 102 polarization of water waves 102 polarization of a spring wave 103 polarization of light
P.07.PS.04 Physical Science	Physics	Students shall demonstrate an understanding of wave and particle motion.	Calculate problems relating to wave properties:	221 importance of wavelength of sound waves	83 find speed of a wave 86 adjust frequency of a standing wave
P.07.PS.05 Physical Science	Physics	Students shall demonstrate an understanding of wave and particle motion.	Describe how the physical properties of sound waves affect its perception	219 frequency of sound and pitch	90 what is sound and how do we hear it?

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P.07.PS.06 Physical Science	Physics	Students shall demonstrate an understanding of wave and particle motion.	Define light in terms of waves and particles	245 we see color in terms of reflected light 264 human eye as an optical instrument 474 ultraviolet and infrared light	
P.07.PS.07 Physical Science	Physics	Students shall demonstrate an understanding of wave and particle motion.	Explain the formation of color by light and by pigments	242 color and frequency of light waves 243 RGB model of color	104 investigate RGB model of color 105 explore relationship between color and wavelength
P.07.PS.08 Physical Science	Physics	Students shall demonstrate an understanding of wave and particle motion.	Investigate the separation of white light into colors by diffraction		101 observing white light through diffraction grating
P.07.PS.09 Physical Science	Physics	Students shall demonstrate an understanding of wave and particle motion.	Illustrate constructive and destructive interference of light waves	206 constructive and destructive interference 210 can wave interference sink a ship? 223 interference of sound waves 225 consonance and dissonance and beats	95 interference and sound waves 95 investigate interference with sound waves

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P.07.PS.10 Physical Science	Physics	Students shall demonstrate an understanding of wave and particle motion.	Differentiate among the reflected images produced by concave, convex, and plane mirrors	260 reflection and mirrors 273 find the angle of reflection	106 tracing incident and reflected rays 107 investigate how light interacts with mirrors 107 plot reflected rays from a mirror 107 investigate reflection of light
P.07.PS.11 Physical Science	Physics	Students shall demonstrate an understanding of wave and particle motion.	Differentiate between the refracted images produced by concave and convex lenses	258 forming images with lenses	108 investigate how light interacts with a prism 108 explore refraction with lenses 110 finding focal point and focal length of a lens 111 plotting images formed when light is refracted by a lens

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P.07.PS.12 Physical Science	Physics	Students shall demonstrate an understanding of wave and particle motion.	Research current uses of optics and sound	196 waves are all around us 220 voice recognition programs 220 white noise 220 sonograms 226 musical instruments 237 microwave ovens 237 radio and television signals 250 identify uses of electromagnetic waves 272 identify uses of electromagnetic waves	90 investigate human perception of sound 98 investigate sound and music
P.08.PS.01 Physical Science	Physics	Students shall demonstrate an understanding of the role of electricity and magnetism in the physical world.	Calculate voltage, current, and resistance from a schematic diagram:	131 Ohm's law explained 132 using Ohm's law to analyze circuits	50 Ohm's law

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P.08.PS.02 Physical Science	Physics	Students shall demonstrate an understanding of the role of electricity and magnetism in the physical world.	Calculate electrical power using current and voltage:	101 concept of electric current 114 voltage and potential energy 115 how to measure voltage 117 electrical current explained 119 how to measure current 145 single path vs. branching paths 145 holiday lights as series or parallel	44 investigate concept of voltage 46 investigate concept of electric current 57 compare brightness of bulbs in series vs. parallel 61 compare current and voltage and resistance in each type of circuit
P.08.PS.03 Physical Science	Physics	Students shall demonstrate an understanding of the role of electricity and magnetism in the physical world.	Calculate electrical energy using electrical power and time:	68 compound machines 101 concept of electric current 117 electrical current explained 119 how to measure current	29 design and construct complex gear machines 46 investigate concept of electric current
P.08.PS.04 Physical Science	Physics	Students shall demonstrate an understanding of the role of electricity and magnetism in the physical world.	Explain the use of electromagnets in step-up and step-down transformers	164 what is an electromagnet? 166 increased current vs. strength of magnetic field 166 building an electromagnet	66 build an electromagnet 67 find out what happens to strength of electromagnet when current is increased
P.08.PS.05 Physical Science	Physics	Students shall demonstrate an understanding of the role of electricity and magnetism in the physical world.	Research current uses of electromagnets	164 what is an electromagnet? 166 increased current vs. strength of magnetic field 166 building an electromagnet	66 build an electromagnet 67 find out what happens to strength of electromagnet when current is increased