

Correlation to Illinois Learning Standards for Science
***Foundations of Physical Science* Student Text and Investigation Manual**

Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
11.A.4a Scientific Inquiry	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of scientific inquiry.	Formulate hypotheses referencing prior research and knowledge.	20 79	finding variability in data look at force data and decide the usefulness of a machine	6 9 18 19 21 30 34 35 45 141 166 166 178 198 198	formulate hypothesis devise a hypothesis use data to describe relationship between force and motion use data to infer correct relationship between variables construct reasonable explanation based on data interpret block and tackle data formulate hypothesis study data and determine importance of height on speed of marble analyze data and explain a rule build models of Na and Cl and use them to explain bonding devise hypothesis and explain which method will give fastest dissolving rate? formulate hypothesis formulate hypothesis which type of food contains the most energy?

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11.A.4b Scientific Inquiry	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of scientific inquiry.	Conduct controlled experiments or simulations to test hypotheses.	11 26	control and experimental variables independent and dependent variables	7 7 9 10 10 12 16 21 27 30 34 40 75 145 151	doing a controlled experiment perform your own experiment conduct three experiments with appropriate equipment selecting ramp and photogates conduct car/ramp experiment select equipment and set up experiment investigate Newton's 2nd law choose independent and dependent variables for graph recognize variables rigging block and tackle investigate motion on a rollercoaster choose circuit parts to light a bulb perform self-designed experiment carry out procedure and select equipment select materials from list

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11.A.4c Scientific Inquiry	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of scientific inquiry.	Collect, organize and analyze data accurately and precisely.	12	importance of reliable and accurate data collection	4	difference between precise and accurate data
				24	making a graph	6	electronic timer and release technique
				24	interpretations of patterns in data	6	compare results with other groups
				26	creating graphs	7	record time interval
				27	reading a graph	9	collect speed data
				41	make a graph	9	construct a data table
				42	analyze a speed/distance graph	11	analyze speed change of car
				78	analyze lever diagram	11	graph speed vs. position
						12	understand and use data table
						13	graph distance vs. time
						14	record three different time intervals
						15	construct a quantitative graphical model
						15	interpret a speed vs. time graph
						17	record times
						17	record results in data table
						18	study data table for relationship between force and motion

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						18	organize different combinations of data
						24	use data table to record results
						24	collect weight data
						25	analyze block and tackle data
						25	collect force data
						27	write down the number of weights you use
						27	use data table to record results
						27	analyze lever equilibrium data
						30	record ropes and pulley data in table
						35	does data support hypothesis?
						36	organize data into a table
						36	collect precise speed and height data
						37	organize data into a graph of speed vs. height
						45	did battery voltage change?
						51	graph voltage vs. current
						75	create data table for self-designed experiment

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						75	collect mass and amplitude data
						76	analyze pendulum data
						121	graph mass vs. volume
						147	organize observations into a category table
						147	students analyze chemical change lab results
						150	record data as you perform experiment
						151	design a data table
						167	collect time data and record observations
						167	use data table for observations
						173	organize water quality data into a table
						181	construct a graphical model
						183	construct a temperature vs. time graph

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11.A.4d Scientific Inquiry	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of scientific inquiry.	Apply statistical methods to the data to reach and support conclusions.	26 31 38	drawing a best fit curve determining slope of a line determining slope of a line	11 11 13 15 21 129 167	draw best fit curve use your graph to predict speed draw best fit curve calculating acceleration from the slope of the line think about percent change find average velocity average dissolving rate
11.A.4e Scientific Inquiry	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of scientific inquiry.	Formulate alternative hypotheses to explain unexpected results.			151 157 167	do the data support the hypothesis add new rules to list based on findings what was happening at molecular level?

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11.A.4f Scientific Inquiry	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of scientific inquiry.	Using available technology, report, display and defend to an audience conclusions drawn from investigations.	20	explain your reasoning	9	present conclusions to the class
						9	reporting on an experiment
						37	describe the flow of energy based on experimental graph
						39	give a brief presentation to the class
						47	present and defend an explanation
						145	present findings and methods used
						145	present findings to the class
						151	present results to the class
11.B.4a Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Identify a technological design problem inherent in a commonly used product.	74	sample engineering problem	70	proposing and comparing different electric motor designs

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11.B.4b Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Propose and compare different solution designs to the design problem based upon given constraints including available tools, materials and time.			70	designing and testing different electric motors
11.B.4c Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Develop working visualizations of the proposed solution designs (e.g., blueprints, schematics, flowcharts, cad-cam, animations).	24 26 41	making a graph creating graphs make a graph	4 13 15 37 41 51 121 147 181 183	dimensional diagrams graph distance vs. time construct a quantitative graphical model organize data into a graph of speed vs. height drawing and interpreting circuit diagrams graph voltage vs. current graph mass vs. volume organize observations into a category table construct a graphical model construct a temperature vs. time graph

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11.B.4d Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Determine the criteria upon which the designs will be judged, identify advantages and disadvantages of the designs and select the most promising design.			71	did draining the batteries affect motor speed?
						71	which motor gave the highest speed and why?
						71	testing a motor for performance
11.B.4e Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Develop and test a prototype or simulation of the solution design using available materials, instruments and technology			70	proposing and comparing different electric motor designs
11.B.4f Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Evaluate the test results based on established criteria, note sources of error and recommend improvements.			71	did draining the batteries affect motor speed?
						71	which motor gave the highest speed and why?

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11.B.4g Technological Design	Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	Know and apply the concepts, principles and processes of technological design.	Using available technology, report to an audience the relative success of the design based on the test results and criteria.	20	explain your reasoning		<p>data tables and graphs can be created on computer or graphing calculator</p> <p>9 present conclusions to the class</p> <p>37 describe the flow of energy based on experimental graph</p> <p>39 give a brief presentation to the class</p> <p>47 present and defend an explanation</p> <p>145 present findings and methods used</p> <p>145 present findings to the class</p> <p>151 present results to the class</p>

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12.C.4a Physical Science	Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.	Know and apply concepts that describe properties of matter and energy and the interactions between them.	Use kinetic theory, wave theory, quantum theory and the laws of thermodynamics to explain energy transformations.	195	waves transmit energy	119	investigate temperature and energy transfer in melting process
				196	waves are all around us		
				234	electrons and energy levels and light emission	134	what does atomic structure have to do with light and color?
				237	microwave ovens		
				237	radio and television signals	158	investigate energy changes in chemical reactions
				250	identify uses of electromagnetic waves	158	measure energy changes in 3 different reactions
				272	identify uses of electromagnetic waves		
				381	exothermic reactions and MREs		
				382	endothermic reactions and cold packs		
				474	energy and radiation relationships		

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12.C.4b Physical Science	Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.	Know and apply concepts that describe properties of matter and energy and the interactions between them.	Analyze and explain the atomic and nuclear structure of matter.	311	protons/neutrons/electrons	132	building atom models
				311	location/size/charge of subatomic particles	133	location of electrons in atom
				315	atoms of same element have same atomic number	133	protons and neutrons
				318	proton/electron attraction	136	model stable and neutral atoms
				387	fusion and fission explained	137	importance of atomic number
				388	showing valence electrons in a diagram	137	build atomic models
						138	fusion and fission
						140	find the number of electrons in outermost level
						140	review subatomic particles
						160	radioactive decay

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12.D.4a Physical Science	Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.	Know and apply concepts that describe force and motion and the principles that explain them.	Explain and predict motions in inertial and accelerated frames of reference.		Newton's third law summarized 45	8	calculating speed
				14	how to calculate speed	9	collect data and calculate speed of car
				15	compare and contrast speed and velocity	10	calculate speed of the car
				20	find speed of bumblebee	12	calculate speed of moving car
				20	calculate speed of car	12	find speed of car at different positions
				24	accurate speed measurements	13	make a position vs. time graph
				30	position vs. time graphs	14	calculate speed of car at two places on the ramp
				32	average speed discussed	14	calculate acceleration of car on ramp
				32	average speed vs. instantaneous	14	exploring acceleration on a ramp
				33	understanding acceleration	14	acceleration is the rate at which speed changes
				35	how to calculate acceleration	15	make a speed vs. time graph
				36	examples of acceleration	16	thinking about force
				37	speed vs. time graphs	16	2nd law
				41	find acceleration of car	16	unbalanced forces and acceleration of car
				42	calculate speed from distance/time graph	17	explore 2nd law and acceleration
				45	Newton's second law summarized	17	calculate speed of car
				45	Newton's first law summarized		

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				46	force has potential to change motion	19	find correct relationship between force mass and acceleration
				48	Newton's first law in detail		
				49	force is related to acceleration	19	discover 2nd law of motion
				49	Newton's second law in detail	20	force and motion with car and ramp
				49	link between force and acceleration	21	effect of friction on the car
				51	balanced and unbalanced forces	22	car and ramp and Newton's 3rd law
				51	net force explained	23	using 3rd law to explain common phenomena
				53	acceleration due to gravity	36	find speed of marble
				56	friction explained	185	find efficiency of water heater
				59	Newton's third law in detail		
				64	research effect of friction on human joints		
				64	solving problems using $f=ma$		
				85	efficiency and bicycles		
				97	calculate work output from efficiency data		

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12.D.4b Physical Science	Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.	Know and apply concepts that describe force and motion and the principles that explain them.	Describe the effects of electromagnetic and nuclear forces including atomic and molecular bonding, capacitance and nuclear reactions	278	compounds are composed of elements	136	strong force
				324	use the periodic table to predict chemical formulas	136	ions
				324	which element is more likely to combine with other elements?	138	nuclear reactions
				324	which element is more likely to combine with other elements?	138	fusion and fission
				335	chemical bonding and the periodic table	140	who do atoms form chemical bonds?
				343	mole quantities	141	modeling a chemical bond
				357	chemical reactions involve rearrangement of atoms	141	when an atom ionizes
				357	chemical reactions involve rearrangement of atoms	142	who do atoms combine in certain ratios?
				359	balancing chemical equations	143	ionic compounds
				364	carbon chains	144	show ratios in which elements combine to form a compound
				387	fusion and fission explained	148	reactants and products
				388	nuclear vs chemical reactions	149	practice balancing equations
				389	strong nuclear force	152	predict how much product formed given the reactants
				389	forces in the nucleus	152	write the balanced equation
				389	electromagnetic force	157	predict the products of double displacement reactions
				393	carbon dating	160	radioactive decay
				393	radioisotopes in science and medicine	160	how do you simulate nuclear decay?
400	research pros and cons of nuclear technology						

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						161	research pros and cons of uses for radioactive elements
						162	carbon reactions and the environment

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13.A.4a Practices of Science	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply the accepted practices of science.	Estimate and suggest ways to reduce the degree of risk involved in science activities.	500 501 501	featured throughout CPO Science program safety rules described safety quiz safety quiz	20 24 26 40 44 56 58 146 150 158 164 168 172 180 182 186 192 198 200	featured throughout CPO Science program safety tip for car/ramp setup ropes and pulley safety safety tip for hanging weights from lever electrical safety short circuit safety warning short circuit safety warning short circuit safety warning safety in the lab chemistry safety wear goggles and apron safety equipment hot water safety safety tip for water testing thermometer safety heat safety thermometer safety heat safety heat safety safely using rubber bands

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13.A.4b Practices of Science	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply the accepted practices of science.	Assess the validity of scientific data by analyzing the results, sample set, sample size, similar previous experimentation, possible misrepresentation of data presented and potential sources of error.	11	controlling variables in experiments	7	what variables should be controlled?
				19	which group did the best experiment?	11	calculate % error
				19	did you run a controlled experiment?	18	evaluate graphs as to whether or not they show relationships between variables
				20	what factors could explain the variability in their data?	21	evaluate percent change for data collected
						75	evaluate statistical significance
						76	calculate % error
						129	control the height of the liquid
						151	does your experiment agree with law of conservation of mass?
						165	why was plain water tested?
						165	what does the word "control" mean?
						167	evaluate method based on data

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13.A.4c Practices of Science	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply the accepted practices of science.	Describe how scientific knowledge, explanations and technological designs may change with new information over time (e.g., the understanding of DNA, the design of computers).	34 45 54 105 107 312 313 321 324 393	Aristotle vs. Newton Newton's Laws of Motion Newton and the force of gravity Benjamin Franklin Charles-Augustin Coulomb contributions of Fermi development of atomic theory contributions of Mendeleev research and create a poster to illustrate development of atomic model contributions of Marie and Pierre Curie	130	investigate Rutherford's gold foil experiment
13.A.4d Practices of Science	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply the accepted practices of science.	Explain how peer review helps to assure the accurate use of data and improves the scientific process.	73	impact of Da Vinci's work		

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Standard #: Area	State Goal	Learning Standard	Learning Expectation	student text pg	detail	investigation pg	detail
13.B.4a Science, Technology, and Society	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply concepts that describe the interaction between science, technology and society.	Compare and contrast scientific inquiry and technological design as pure and applied sciences.				
13.B.4b Science, Technology, and Society	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply concepts that describe the interaction between science, technology and society.	Analyze a particular occupation to identify decisions that may be influenced by a knowledge of science.			174 water quality testing 177 chemistry and photography	
13.B.4c Science, Technology, and Society	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply concepts that describe the interaction between science, technology and society.	Analyze ways that resource management and technology can be used to accommodate population trends.	364 379 379 400 421 425 430 444 448	petroleum research fuel cells research environmental impact of fuel cells problems caused by airborne pollutants wise use of water water cycle and conservation water usage and quality acid rain explained research the issue of acid rain	163 163 163 172 172 174 175 178	consider a vehicle's fuel economy research how trees offset accumulation of CO ₂ can trees compensate for manmade CO ₂ from vehicles and industry? save water for houseplants perform water quality tests wise use of water supply maintaining water supply quality investigate effect of acid rain on microorganisms

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13.B.4d Science, Technology, and Society	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply concepts that describe the interaction between science, technology and society.	Analyze local examples of resource use, technology use or conservation programs; document findings; and make recommendations for improvements.	333	problems with disposing of plastics	163	consider a vehicle's fuel economy
				355	recycling tires	163	research how trees offset accumulation of CO2
				356	recycling discarded tires	163	can trees compensate for manmade CO2 from vehicles and industry?
				364	petroleum	172	save water for houseplants
				379	research fuel cells	172	perform water quality tests
				379	research environmental impact of fuel cells	174	wise use of water supply
				392	storage of nuclear waste	175	maintaining water supply quality
				400	problems caused by airborne pollutants		
				421	wise use of water		
				425	water cycle and conservation		
				430	water usage and quality		
13.B.4e Science, Technology, and Society	Understand the relationships among science, technology and society in historical and contemporary contexts.	Know and apply concepts that describe the interaction between science, technology and society.	Evaluate claims derived from purported scientific studies used in advertising and marketing strategies.	110	study appliance labels and instructions	76	analyze watch manufacturer's claims
				142	create pamphlet on utility's energy saver programs	162	inferences from promotional materials for vehicles
				434	study claims made by bottled water companies	173	study water filtration device claims