

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.1.1 9 - 12	Unifying Concepts and Processes	Unifying concepts and processes help students think about and integrate a range of basic ideas which builds an understanding of the natural world.	Students will develop an understanding of systems, order, and organization.	2	structure of the universe and laws of nature	28	system of Atwood's machine
				24	time scales in physics	44	forces in equilibrium
				86	zero net force in equilibrium		
				99	weight in equilibrium problems		
				106	definition of equilibrium		
				108	applications of equilibrium		
				111	equilibrium and reaction or normal forces		
				115	understanding of equilibrium		
				119	drawing displacement vector using a scale		
				133	equilibrium of forces and balancing forces		
				163	rotational equilibrium		
				175	explain rotational equilibrium		
				202	processes		
				204	natural systems and efficiency		
				205	efficiency of plants		
				206	reversible and irreversible processes		
				210	power in natural systems		
				212	energy flow in systems		

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				213	breaking down an energy flow system into processes		
				214	steady state energy balance of Earth		
				214	natural systems work in cycles		
				215	food webs and ecosystems		
				225	form changes in inelastic collisions		
				244	harmonic motion in natural systems		
				248	harmonic motion and equilibrium		
				250	stable and unstable equilibrium		
				251	restoring forces and inertia affect natural frequency		
				255	a system view of resonance		
				264	equilibrium level of waves		
				420	lightning and electric charge		
				447	the magnetic field of Earth		
				449	shifting and reversal of Earth's magnetic poles		
				499	scale and Brownian motion		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				522	thermal equilibrium		
				528	convection in the ocean		
				566	knowing structure of atom		
				592	system of classifying matter		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.1.2 9 - 12	Unifying Concepts and Processes	Unifying concepts and processes help students think about and integrate a range of basic ideas which builds an understanding of the natural world.	Students will develop an understanding of evidence, models, and explanation.	7	developing models to explain observations	10	calculate percent difference
				11	Ptolemy model vs. Copernicus model of the solar system	12	do your results agree with hypothesis?
				25	why accuracy and precision are important	13	find percent error
				40	creating useful models	13	compare prediction to measurement
				40	making a good model	13	create a graph
				42	controlling variables in experiments	16	describe the graph
				42	controlling variables in experiments	16	create a graph
				43	graphs are a way of representing data	16	what do the results tell you?
				43	constructing a graph	18	are the accelerations different?
				44	graphical models	19	does the ball accelerate?
				44	using a graphical model to make a prediction and checking the model's accuracy	22	create graphs
				44	using a graphical model to make a prediction and checking the model's accuracy	22	compare calculation with graph estimate
				45	recognizing patterns using graphs	22	uniform acceleration model
				54	constructing a graph	22	model for uniform accelerated motion
				54	understanding patterns in relationships between variables	22	how do you measured positions compare to model?
				55	create a graph from a data table	24	create an algebraic model
				56	indicate relationships between variables in graphs	28	solve second law equation for string tension

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				60	creating the acceleration formula from experiments	29	does experiment agree with prediction?
				66	developing the formulas for a model of motion with constant acceleration	32	develop a model that predicts acceleration
				101	a model for friction	33	does your experiment confirm your hypothesis?
				102	a model for static friction	37	make a graph
				188	perpetual motion machines	37	calculate percent difference
				246	understanding graphs of harmonic motion	38	make a graph
				282	write a formula relating velocity of wave to period and wavelength	38	calculate percent difference
				290	the process of digital sound reproduction	43	calculate percent difference
				297	frequency spectrum	43	sketch four graphs
				304	comparison of wave forms from guitar sounds	43	how does the measurement compare to your prediction?
				306	explain why hearing can be damaged by loud sounds	43	discuss sources of error
				306	explain why hearing can be damaged by loud sounds	43	create algebraic model
				307	decibel level vs. frequency graph for human hearing	43	what would happen if...?
				307	decibel level vs. frequency graph for human hearing	45	discuss sources of errors
				312	light intensity follows an inverse square law	49	write a formula
				312	light intensity follows an inverse square law	50	does your experiment provide confirmation?
				330	optics and optical instruments	56	create a graph
				330	optics and optical instruments	58	explain why the angular acceleration is different

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				411	the waveform of AC electricity	66	create a graph of speed vs. position
				427	diagramming electric fields using field lines	66	does this agree with your hypothesis?
				443	diagramming magnetic fields using magnetic field lines	76	compare predicted mass to actual mass
				479	current vs.voltage graph for a transistor	80	explain your observations
				492	the binary number system and its use in computers	82	make three different graphs
						83	calculate percent error
						87	sketch a graph
						87	explain how force applied causes the response
						90	explain why higher tension makes waves move faster
						92	explain how wind might cause big waves in water
						94	give an equation that describes your observations
						109	explain how the colored filters work
						114	are there differences between your prediction and measurement?
						132	what conclusions can you draw?
						133	analyze data and explain a rule

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
						135 graph voltage vs. current	
						136 graph voltage vs. current	
						151 make a graph of voltage vs. time	
						160 create a graph	
						167 make a graph of voltage vs. number of magnets	
						169 make a current vs. voltage graph for the diode	
						189 Bernoulli's equation	
						202 identify two sources of experimental error	
						202 find percent composition	
						208 calculating percent yield	

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.1.3 9 - 12	Unifying Concepts and Processes	Unifying concepts and processes help students think about and integrate a range of basic ideas which builds an understanding of the natural world.	Students will develop an understanding of change, constancy, and measurement	18	measuring distance	1	estimating length
				25	why accuracy and precision are important	6	accuracy and resolution and printing
				25	accuracy and precision of measurements	8	scientific notation practice
				28	expressing very large and very small numbers using scientific notation	13	is there a trend in measurements?
				34	expressing numbers in scientific notation	25	find the average time
				42	controlling variables in experiments	43	discuss sources of error
				42	controlling variables in experiments	43	measure and record the distance
				412	average voltage and current of AC power	45	discuss sources of errors
						51	using scientific notation
						58	find average of three trials
						60	measure input and output forces
						63	as mechanical advantage increases what happens to length of pulled string?
						66	what does the graph tell you?
						67	measure vertical distance
						67	calculate average of three times
						71	calculate average work and power
						82	measure the length of the string
						82	analyze data

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
						133 202	did battery voltage change? identify two sources of experimental error
12.1.4 9 - 12	Unifying Concepts and Processes	Unifying concepts and processes help students think about and integrate a range of basic ideas which builds an understanding of the natural world.	Students will develop an understanding of form and function.	541	form and the strength of materials		
12.1.5 9 - 12	Unifying Concepts and Processes	Unifying concepts and processes help students think about and integrate a range of basic ideas which builds an understanding of the natural world.	students will develop an understanding of change over a period of time.	225 255 420	form changes in inelastic collisions a system view of resonance lightning and electric charge		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.2.1 9 - 12	Science as Inquiry	Science as inquiry requires students to combine processes and scientific knowledge with scientific reasoning and critical thinking to develop their understanding of science.	students will develop the abilities needed to do scientific inquiry.	2	understanding natural laws	11	recognizing and controlling variables
				3	inquiry starts with questions	11	formulate a testable hypothesis
				3	connecting cause and effect through observation	12	was this experiment better or worse than the first?
				3	using life experiences and common sense	12	cause and effect relationships
				4	inquiry through observation	18	propose one way to increase acceleration
				7	creating explanations through observation	21	plan the experiment
				7	revising explanations through observation	21	conduct the experiment
				8	forming hypotheses and testing with experiments	28	set up the ultimate pulley
				8	formulating a hypothesis	33	formulate a testable hypothesis
				8	refining theories based on observations	43	test your prediction
				9	testing ideas against scientific evidence	43	perform experiment
				9	connecting cause and effect through analysis	43	write a procedure
				9	connecting cause and effect through analysis	43	follow the scientific method
				10	the usefulness of phlogiston theory despite being incorrect	48	formulate a hypothesis
				10	putting forth ideas and then testing them	65	investigate motion on a roller coaster
				10	putting forth ideas and then testing them	65	studying motion of ball on loop track
				10	putting forth ideas and then testing them	65	where does the marble move the fastest?

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				11	acceptance of the Copernican model of the solar system on the basis of scientific evidence	65	form a hypothesis
				40	defining variables	67	set up the straight track
				42	control and experimental variables	67	investigate motion on a roller coaster
				42	writing lab procedures	79	safety note
				43	dependent and independent variables in graphs	79	write a hypothesis
				44	checking a graphical model's accuracy	82	determine which variable has the greatest effect
				45	recognizing patterns and cause and effect relationships	82	dependent and independent variables
				54	importance of changing one variable at a time in an experiment	82	design an experiment
				71	parachutes and air resistance	82	plan three experiments to determine which variable affects the period of a pendulum
				103	evaluating perpetual motion claims	85	select appropriate technology to make measurements
				242	finding a basic cycle of harmonic motion	85	design and test a way to increase natural frequency
				251	changing the natural frequency of a stretched rubber band	89	what is it that moves in the case of a wave?
				293	demonstrating the Doppler effect	90	what effect does changing the tension have?
						97	reliability of a double-blind test
						97	did the method give an accurate result?
						109	record observations

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				323	using glow-in-the-dark plastic to demonstrate photon energy levels	110	examine the effects of glow-in-the-dark material
				423	charge by friction	111	do your observations support this hypothesis?
				432	making a simple capacitor	129	safety precautions
				456	an experiment with a wire and compass	129	choose circuit parts to light a bulb
				463	building an electromagnet with wire and a nail	131	safety precautions
				467	experiment demonstrating electromagnetic induction	147	how did A and B tapes acquire different charge?
				543	safety factors	150	safety note
						159	safety note
						160	electromagnet safety
						166	variables that affect the performance of the generator
						176	heat safety
						176	safety note
						185	safety tip
						192	gas pressure safety note
						201	determine the equipment you will need
						201	design a procedure to separate a mixture
						201	develop a procedure
						202	conduct your experiment

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
						202 would you modify your procedure further? 204 build models of Na and Cl and use them to explain bonding 206 acid safety	

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.3.4 9 - 12	Physical Science	Physical science focuses on the science facts, concepts, principles, theories, and models that are important for all students to know, understand, and use.	students will develop an understanding of motions and forces.	13	biomechanics	9	collect data and calculate speed of car
				13	physics and bicycles	9	calculate speed of rolling marble
				13	physics applies to the internal working of the body	10	make object move with speed of 1 m/sec
				18	definition of distance and length	12	finding speed of ball with one photogate
				26	weight is a measure of the force of gravity pulling on mass	13	graph speed versus position
				26	inertia is an effect of mass	14	find the speed of the ball
				26	calculating weight from mass	15	find speed of the ball
				27	understanding and measuring mass	16	create a speed vs. time graph
				36	speed is relative	16	create a position vs. time graph
				36	the precise meaning of speed	17	find two speeds
				37	how to calculate speed	17	learn techniques for finding acceleration
				37	calculating speed	17	find the acceleration
				38	the speed formula and calculating speed	17	studying acceleration
				38	compare and contrast speed and velocity	19	make a speed vs. time graph
				41	effect of friction on motion of a ball on a ramp	20	understanding equation for uniform accelerated motion
				41	speed of a ball on a ramp	20	speed vs. time graph for uniform acceleration

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				46	speed is the rate of change of position	21	calculate speed of ball
				46	definitions of position and distance	22	create a position vs. time graph
				47	position vs. time graph	22	create a speed vs. time graph
				47	average and instantaneous speed	23	investigate the effect of gravity
				48	graphs showing changes in speed	25	derive acceleration equation
				48	determining speed from the slope of a position vs. time graph	26	study Newton's first law
				48	determining speed from the slope of a position vs. time graph	26	make ball roll at constant speed
				48	determining speed from the slope of a position vs. time graph	27	collect data on Newton's first law
				49	distance on the speed vs. time graph	27	explain how Newton's first law applies
				49	speed vs. time graph for constant speed	27	were any forces acting on the ball?
				50	graphs for motion of increasing speed and decreasing speed	28	investigate Newton's second law
				50	speed vs. time graph for downhill motion	29	calculate the acceleration
				50	speed vs. time graph for downhill motion	30	Newton's third law and free body diagrams
				54	graphing speed vs. time	30	investigate Newton's third law
				55	analyzing distance vs. time graph	31	draw free body diagrams and identify action-reaction pairs
				55	calculate the average speed and distance traveled		

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				58	acceleration is the rate of change in the speed of an object	33	calculate the predicted speed
				59	comparing speed and acceleration	34	investigate static and sliding friction
				60	calculating acceleration from experiments	34	calculate the weight
				60	formula for acceleration	39	investigating vectors
				60	formula for acceleration	39	studying position vectors
				61	zero acceleration vs. constant acceleration vs. acceleration with zero speed	40	using polar coordinates
				61	zero acceleration vs. constant acceleration vs. acceleration with zero speed	41	calculate the resultant vector
				61	any acceleration must come from a force	41	plotting position with cartesian coordinates
				61	constant speed and constant acceleration	42	find initial speed of ball
				61	general definition of acceleration	43	calculate the velocity vector
				62	speed vs. time graph for accelerated motion	44	investigating force vectors
				62	speed vs. time graph for accelerated motion	45	balancing a specified force
				62	acceleration is total change of speed divided by total change in time	45	calculate force components
				63	calculating acceleration from a speed vs. time graph	46	contrasting linear and angular motion
				63	calculating acceleration from a speed vs. time graph	46	investigating angular speed
				63	complex speed vs. time graphs	49	investigating centripetal force
				64	calculate speed in accelerated motion	49	consider forces acting on the ball

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				64	calculate speed in accelerated motion	49	draw a free body diagram and label forces
				64	calculating the speed of an object that is accelerating	50	calculate the speed of the ball
				65	calculating distance from speed vs. time graph	51	calculate gravitational force of attraction
				67	calculate time and distance from acceleration	51	investigate law of universal gravitation
				68	free fall and acceleration due to gravity	52	converting mass to weight
				69	motion formulas for free fall	53	relationship between force and torque
				70	calculating height and time of flight in free fall problems	53	calculating torque
				70	solving problems with free fall	54	explore rotational equilibrium and net torque
				70	solving problems with free fall	55	center of mass explained
				71	air resistance and terminal speed	55	investigate center of gravity
				71	air resistance and terminal speed	57	investigating rotational inertia
				71	acceleration of gravity does not depend on mass	58	rotational application of Newton's second law
				72	friction and traction and antilock brakes	59	investigate block and tackle machine
				74	understanding average speed and instantaneous speed	60	operate and study a block and tackle machine
				74	describing motion with speed vs. time graph	61	find the mechanical advantage

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				74	sketching speed vs. time graphs for different changes of motion	61	what effect does friction have on mechanical advantage?
				75	problem understanding acceleration due to gravity	62	investigate block and tackle machine
				75	problem using frames of reference	66	find the speed of the ball
				75	calculations of speed	68	what is speed of the ball?
				76	analyzing graph for changes in motion	73	calculating momentum
				78	force is an action that can change motion	73	momentum is a vector
				78	changes in motion only occur through force	75	investigate collisions and conservation of momentum
				79	what systems in a car overcome the law of inertia	76	calculate speeds of projectile and target balls
				79	descriptions of inertia and Newton's first law	77	the momentum form of Newton's second law
				79	all objects tend to resist changes in motion	77	relationship between force and motion and the second law
				80	Newton's laws and cup holders	78	which ball had a greater change in momentum?
				80	seat belts and air bags and Newton's first law	79	investigate angular momentum
				81	Newton's second law of motion	80	torque changes the direction of angular momentum vector
				81	force is related to acceleration	80	explain life application of conservation of momentum

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				82	English unit of force is the pound	80	angular momentum behaves like a vector
				83	finding the net force	84	restoring forces and equilibrium
				83	calculation using Newton's second law	85	where is the mass that provides inertia?
				84	calculating net force	90	calculate the speed of the wave pulse
				84	Newton's second law and dynamics problems	128	relativity and frames of reference
				84	direction of net force and acceleration and speed	154	how are magnetic field lines similar to electric field lines?
				85	finding force from acceleration	159	build an electromagnet
				85	if there is acceleration there must be force	160	find out what happens to strength of electromagnet when current is increased
				85	force problems	160	what happens to the strength of an electromagnet when you increase the current?
				86	zero acceleration means net zero force	191	calculate speed of air in homemade air-speed tester
				87	explaining Newton's third law in terms of an astronaut moving through space		
				87	forces always come in pairs		
				87	forces always occur in action-reaction pairs		
				88	Newton's third law operates on pairs of objects		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				88	explaining Newton's third law in terms of moving a skateboard		
				89	identifying which force is acting on which object		
				89	solving problems with action-reaction forces		
				90	examples of Newton's third law		
				90	the natural jet engine in a squid		
				91	force platform used to analyze forces from running and walking		
				92	measuring forces from a vertical jump		
				92	force from a vertical jump		
				93	explain the difference between mass and weight		
				93	problems using Newton's first law and second law		
				94	inertia problem		
				94	force calculations in different units		
				94	seat belt problem		
				96	differences between mass and weight		
				97	strength of gravity on Earth and Jupiter		

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				97	calculating weight with mass and gravity		
				98	weight and acceleration		
				98	effects of g forces and zero gravity on the human body		
				98	gravity and acceleration and weightlessness		
				99	balanced force problems		
				99	weight is a force but mass is not		
				99	weight calculations		
				100	friction is a force that resists motion		
				100	the force of friction and the different types of friction		
				101	a model for friction		
				102	the normal force as the reaction in an action-reaction pair		
				102	calculating the force of friction		
				103	net force includes the force of friction		
				103	friction and motion		
				103	calculate the acceleration of a car including friction		
				104	reducing friction force		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				105	friction is the force that keeps nails and screws in place		
				105	friction applications		
				106	Newton's second law and net force		
				106	net force must be zero in equilibrium		
				107	forces on a free-body diagram		
				107	net force of zero and free-body diagram		
				108	equilibrium and Newton's second law		
				108	use equilibrium to find an unknown force		
				109	the force from a spring		
				109	restoring force of a spring		
				110	Hooke's law		
				110	restoring force of a spring		
				110	Hooke's law and restoring force of a spring		
				111	understanding reaction forces in terms of springs and deformation		
				111	solid materials act like springs		
				111	solid materials exert restoring force		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				112	analysis of forces on a bridge		
				115	explain weight and mass		
				115	friction of a pulled sled		
				116	calculate the acceleration of a toy		
				116	calculate mass from weight		
				118	vectors have magnitude and direction		
				119	the displacement vector and measuring displacement		
				119	adding vectors		
				119	displacement vectors		
				120	adding vectors		
				120	representing vectors in Cartesian and polar coordinates		
				121	adding and subtracting vectors		
				122	calculating vector components		
				123	finding magnitude and angle of a vector		
				124	definition of the velocity vector		
				124	projectiles and trajectories		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				124	effects of friction on trajectories		
				125	speed is the magnitude of the velocity vector		
				125	the velocity vector		
				125	representing the velocity vector in polar and Cartesian coordinates		
				125	the velocity vector		
				126	components of the velocity vector		
				126	components of the velocity vector		
				126	representing the velocity vector in polar and Cartesian coordinates		
				127	calculating velocity vectors may require knowing frames of reference		
				127	adding velocity vectors		
				127	adding velocity vectors		
				128	gravity only accelerates vertical motion		
				128	constant velocity of horizontal component of projectile motion		
				128	independence of horizontal and vertical motion in a velocity vector		

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				129	analyze a horizontally launched projectile		
				129	vertical motion of a projectile		
				130	calculating velocity components of initial velocity		
				130	projectiles launched at an angle		
				130	analyzing changing velocity in vertical component of projectile motion		
				131	range of projectiles		
				132	representing the force vector in Cartesian and polar coordinates		
				132	the force vector describes the strength and direction of a force		
				132	interpreting the x-y components of force		
				133	calculating components of a force vector		
				133	balancing forces in two dimensions		
				134	choosing coordinates for an inclined plane		
				134	forces on an inclined plane		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				134	resolving force of gravity in ramp coordinates		
				135	acceleration down an inclined plane		
				135	frictional force on an inclined plane		
				135	normal force of an inclined plane		
				136	calculating acceleration on a ramp accounting for friction		
				136	calculate the acceleration of a skier on a slope		
				136	calculating acceleration on a ramp		
				137	the vector form of Newton's second law		
				137	predicting motion in three dimensions and controlling force and acceleration in space missions		
				137	calculating acceleration from 3-D forces		
				139	determining position by triangulation and inertial navigation		
				141	effects of gravity on motion of a projectile		
				141	calculate the net force		

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				141	explain vectors in Cartesian and polar coordinates		
				142	effects of friction on acceleration		
				142	calculating acceleration for sled on slope		
				144	rotation and revolution and angular speed		
				145	calculating angular speed in radians per second		
				146	angular speed of a moving wheel		
				146	calculating linear speed of a moving wheel		
				146	the relationship between linear and angular speed		
				147	speedometers and odometers		
				147	the linear speed of a rolling wheel		
				148	direction of force determines linear or rotational motion		
				148	acceleration can be a change in the direction of motion		
				148	centripetal force causes circular motion		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				149	calculating centripetal force		
				149	calculating centripetal force		
				150	centripetal acceleration		
				150	calculate the centripetal acceleration of a motorcycle		
				150	formula for centripetal acceleration		
				150	using centripetal acceleration to create the feeling of gravity by rotating the space station		
				151	banked turns		
				151	centrifugal force is actually an example of inertia		
				152	attractive force between mass of person and mass of object is weight		
				152	law of universal gravitation and orbital motion		
				152	description of law of universal gravitation		
				153	formula and calculations for law of universal gravitation		
				154	orbital motion		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				154	orbits and gravitational force		
				154	satellites and orbital motion		
				155	satellite motion application		
				155	centripetal force and the law of universal gravitation combine to form the orbit equation		
				155	satellite motion application		
				155	centripetal force and the law of universal gravitation combine to form the orbit equation		
				156	satellites in orbit		
				156	HEO and geostationary orbit		
				157	compare linear and angular speeds		
				158	calculating centripetal force		
				158	calculate weight and acceleration due to gravity on Pluto		
				158	compare projectile motion to orbital motion		
				160	center of rotation		
				160	how torque and force differ		

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				160	using torque in household devices		
				160	translation and rotation		
				161	line of action and the torque created by a force		
				161	force on a wrench		
				161	calculating torque using torque equation		
				162	calculating torque		
				162	units of torque		
				162	combining torques to find the net torque		
				163	in rotational equilibrium the net torque is zero		
				163	solve a rotational equilibrium problem		
				164	when force and lever arm are not perpendicular		
				164	calculate a torque from an angled force		
				165	finding the center of mass		
				165	the motion of a tossed object		
				166	centers of mass and gravity may differ		
				166	finding the center of gravity		
				166	finding the center of mass		

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				167	balancing an object		
				167	area of support		
				168	rotational inertia and mass distribution		
				168	Newton's first law and rotational inertia		
				169	rotational inertia		
				169	Newton's second law applies to rotational motion		
				169	relationship between angular acceleration and linear acceleration		
				170	moment of inertia		
				170	rotational inertia and center of mass		
				171	Newton's second law for rotational motion variables		
				171	angular acceleration of a wheel		
				171	rotational motion and linear motion		
				172	force and torque transformations in bicycles		
				173	changing gears in a bicycle		
				173	force and torque transformations in bicycles		
				174	calculating torque		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				174	compare force and torque		
				175	analyze centers of gravity		
				175	analyze centers of mass		
				178	input and output for simple machines		
				178	how simple machines manipulate forces		
				179	how to calculate mechanical advantage		
				179	types of simple machines		
				180	mechanical advantage of human arm		
				180	the mechanical advantage of a lever		
				181	how a lever works		
				181	crowbar as an example of a lever		
				181	how a lever works		
				181	torque and mechanical advantage of a lever		
				182	mechanical advantage of ropes and pulleys		
				183	small drills use gears		
				183	mechanical advantage of gears		
				183	how wheels and gears work		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				183	friction and mechanical advantage of wheel and axle		
				184	ramps and screws		
				184	friction and mechanical advantage of ramps and screws		
				184	screw turns rotating motion into linear motion		
				186	work done by a force at an angle to the distance		
				187	work done against gravity		
				191	potential energy comes from gravity		
				200	calculate fulcrum point of a lever		
				209	estimating power requirements based on force		
				216	tides are due to force of gravity		
				222	comparison of kinetic energy and momentum		
				222	Newton's first law and momentum		
				223	momentum is a vector		
				223	momentum formula and calculating momentum		
				224	law of conservation of momentum		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				224	momentum and Newton's third law		
				225	conservation of momentum in collisions		
				226	solving elastic and inelastic collision problems		
				226	applying conservation of momentum		
				227	momentum conservation for collisions in two and three dimensions		
				228	car crash safety		
				228	Newton's second law relating force and momentum		
				228	seat belts and air bags		
				229	force on a rocket from change in momentum		
				229	momentum form of Newton's second law		
				230	calculate change in momentum for elastic vs. inelastic collisions		
				230	impulse formula		
				231	conservation of angular momentum examples		
				231	linear and angular momentum		
				231	what is angular momentum		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				232	angular momentum depends on speed and mass and shape		
				232	conservation of angular momentum		
				233	formula for angular momentum		
				233	moment of inertia examples		
				234	gyroscopes and the space shuttle		
				234	torque resists change in angular momentum		
				235	jet engines work because of conservation of momentum		
				236	momentum conservation of turbofan engine		
				237	why is momentum a vector		
				238	cars that crumple in a collision		
				238	compare linear and angular momentum		
				238	momentum in billiards		
				238	difference between impact and impulse		
				239	calculate momentum		
				240	forces in a car stopping		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				243	orbit is a type of cycle		
				245	friction causes damping in oscillators		
				249	harmonic motion in machines		
				249	inertia and restoring force cause harmonic motion		
				252	Newton's second law and natural frequency		
				254	definition of periodic force		
				256	friction and steady state		
				260	velocity vs. time graph of harmonic motion		
				260	position vs. time graph of harmonic motion		
				276	natural frequency and harmonics		
				366	special relativity and time dilation		
				367	relative motion and speed of light		
				369	frequency of light depends on relative motion		
				370	Einstein's thinking about momentum of particles moving near the speed of light		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				371	simultaneity depends on the relative motion of your frame of reference		
				425	electric forces always occur in pairs according to Newton's third law		
				426	fields and forces		
				427	an electric field exists around a charge		
				435	steering the electron beam on television screen		
				437	strength of an electric field		
				440	the difference between magnetic poles and electric charge		
				441	comparing magnetic and electric forces		
				442	torque between two magnets		
				442	force between two magnetics is not an inverse square law		
				443	magnets create a magnetic field around them		
				448	biological compasses of animals		
				456	magnetic field of a wire		
				457	force on a current in a magnetic field		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				460	orbital motion of a charge		
				462	electromagnets		
				463	building an electromagnet		
				464	electric motor uses electromagnets to convert electrical energy to mechanical energy		
				465	how electromagnets are used in electric motors		
				472	electromagnet-based maglev		
				475	diagram of electromagnet		
				548	Newton's third law and pressure in a fluid		
				550	pressure and the third law		
				557	pressure of gases		
				629	conservation of momentum in nuclear reactions		
				642	inertial mass		
				642	Newton's laws and gravity		
				643	frame of reference and the equivalence principle		
				649	every field has an associated particle		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.3.5 9 - 12	Physical Science	Physical science focuses on the science facts, concepts, principles, theories, and models that are important for all students to know, understand, and use.	students will develop an understanding of the conservation of energy and increase in disorder.	188	for all machines work out cannot exceed work in	64	compare output and input work
				189	energy appears in different forms	66	law of conservation of energy
				190	different forms of energy	67	friction as a source of energy dissipation
				190	conversions of energy	68	calculate potential and kinetic energy
				191	the formula for potential energy	68	find the total energy at each position
				191	calculate the potential energy of a cart	72	potential to kinetic energy conversion in a pendulum
				192	the formula for kinetic energy	72	draw an energy flow diagram
				192	calculating kinetic energy depends on speed and mass	74	investigating collisions and conservation of energy
				193	calculate the kinetic energy of a moving car	88	potential to kinetic energy conversions of a pendulum
				193	deriving the formula for kinetic energy	182	investigate convection in a liquid
				194	energy transformations		
				194	conservation of energy explained		
				194	the law of conservation of energy		
				194	energy transformations		
				195	friction can divert some energy		
				195	conservation of energy in a closed system		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				195	applying conservation of energy for a marble rolling on a hilly track		
				196	energy transformation hydroelectric plant		
				196	energy transformation hydroelectric plant		
				197	conservation of energy for Hoover Dam		
				197	calculating energy supplied by Hoover Dam		
				199	kinetic and potential energy conversions while bouncing in a trampoline		
				199	trace the energy transformations from sun to a flashing taillight		
				202	efficiency and energy conversions		
				203	how friction affects machines		
				203	efficiency and conservation of energy		
				204	efficiency of Earth		
				205	calories in food		
				205	efficiency in biological systems		
				206	connection between efficiency and time		

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				206	friction and the arrow of time		
				207	power is the rate of doing work or using energy		
				208	units of power		
				209	calculating power for common devices		
				210	energy from the sun drives the weather on Earth		
				211	estimate average input power of a person		
				212	understand basic forms of energy		
				212	energy conversion		
				212	energy flow in a pendulum		
				213	the conversion process of energy flow		
				215	energy flows in biological systems		
				215	energy flows in biological systems		
				216	estimating the energy in tides		
				216	tidal energy represents frictional energy from the Earth-moon system		
				219	energy flow of a model solar car		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				220	calculate energy and power for humans		
				227	kinetic energy conservation for elastic collisions		
				245	kinetic to potential energy changes in motion of an oscillator		
				245	friction causes damping in oscillators		
				253	oscillators exchange energy back and forth between potential and kinetic		
				253	harmonic motion involves both potential and kinetic energy		
				256	resonant systems accumulate energy		
				277	waves propagate by exchanging energy between two forms		
				310	light is a form of energy		
				320	photosynthesis converts light energy to chemical energy		
				322	photons are bundles of light energy		
				324	light from chemical reactions		

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				356	electromagnetic waves exchange energy between electricity and magnetic parts		
				370	relationship and conservation of mass and energy		
				378	electrical energy		
				384	batteries use chemical energy		
				393	conversion of energy in regenerative braking		
				400	energy conversions in a series circuit		
				451	MRI--energy exchange by a nucleus in a magnetic field		
				464	electric motor uses electromagnets to convert electrical energy to mechanical energy		
				467	electric generators transform mechanical energy into electric energy		
				469	energy conservation and Faraday's law		
				509	heat of fusion		
				510	heat of vaporization		
				511	evaporation and condensation		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				515	thermodynamics and conservation of energy		
				522	heat conduction		
				523	heat conduction		
				524	conduction in solids and liquids and gases		
				526	convection in liquids		
				527	convection depends on speed and surface area		
				528	convection and weather		
				530	radiation		
				535	sources of heat transfer in buildings		
				552	conservation of energy in fluids		
				552	explanation of pressure and energy		
				553	energy conservation and Bernoulli's equation		
				597	the energy of chemical bonds is described		
				606	energy from sunlight stored through photosynthesis		
				619	radiation as a flow of energy		
				622	energy of x-rays		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				625	energy changes in nuclear reactions		
				626	source of energy in nuclear reactions		
				627	fusion reactions and the sun		
				627	energy of fusion reactions		
				628	energy of fission reactions		
				629	conservation of energy in nuclear reactions		
				647	energy from antimatter		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.3.6 9 - 12	Physical Science	Physical science focuses on the science facts, concepts, principles, theories, and models that are important for all students to know, understand, and use.	students will develop an understanding of the interactions of energy and matter.	242	definition of an oscillator	83	investigate oscillators in-phase and out-of-phase
				243	examples of oscillators	84	examples of harmonic motion systems
				246	understanding graphs of harmonic motion	85	investigate natural frequency
				247	the phase of an oscillator	86	investigate resonance and its importance
				247	graphs of in-phase and out-of-phase harmonic motion	88	if frequency is increased what happens to total energy?
				248	equilibrium and oscillators	89	study wave pulses on elastic cord
				251	concept of natural frequency	89	making wave pulses on a string
				252	changing natural frequency	89	study characteristics of a wave pulse on a string
				252	mass on a spring acts as an oscillator	90	study the speed of the wave pulse
				254	concept of resonance	90	measure speed of a wave pulse
				254	periodic force and natural frequency	91	make different types of waves in a ripple tank
				255	resonance occurs when periodic force matches natural frequency	91	making circular waves in a ripple tank
				255	resonance occurs when periodic force matches natural frequency	91	is your water wave transverse or longitudinal?
				258	label graph of harmonic motion	91	making plane waves in a ripple tank
				258	name common oscillators		
				259	resonance and amplitude		

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				262	waves are all around us	92	observing reflection in water waves
				262	waves transmit energy		
				263	waves are a form of traveling energy	92	investigate diffraction in a ripple tank
				264	frequency and amplitude and wavelength in waves	92	investigate reflection in a ripple tank
				264	basic properties of frequency and wavelength and amplitude	93	investigate frequency and wavelength
				265	concept of speed of a wave	94	investigate the frequency of standing waves
				265	speed of a wave vs. speed of its medium	94	investigate the wavelength of standing waves
				265	wave pulse	94	investigate harmonic wave patterns
				266	formula for speed of a wave	95	waves carry energy from one place to another
				267	transverse and longitudinal waves	95	natural frequency and resonance of standing waves on a string
				267	water waves are transverse and Slinky is longitudinal	96	investigate human perception of sound
				268	one- and two- and three-dimensional waves	96	investigate range of frequencies the ear can detect
				268	creating plane waves and circular waves		
				269	propagation of waves through continuous materials	101	investigate interference with sound waves
				270	waves and absorption	109	examining the spectrum of a light source

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				270	waves and refraction	110	all light is produced by atoms
				270	concept of boundaries	122	study properties of the electromagnetic spectrum
				270	waves and diffraction	125	polarization of water waves
				270	waves and reflection	125	study the polarization of a transverse spring wave
				271	waves and refraction and boundaries	125	polarization of a spring wave
				271	waves and reflection and boundaries	126	study the polarization of light
				271	curved boundaries	126	polarization of light
				272	waves and diffraction and boundaries	197	absorption and emission of light by atomic electrons
				272	waves transfer energy through absorption		
				272	waves and absorption and boundaries		
				273	concept of the superposition principle		
				273	constructive and destructive interference		
				273	sound and light waves and interference		
				274	resonance and reflection		
				274	how resonance is created		
				274	natural frequency of waves		
				275	boundaries and natural frequency		

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				275	standing waves and natural frequency and resonance		
				275	standing waves on a string		
				276	concept of harmonics		
				277	energy of a wave		
				277	standing waves are used to store energy		
				277	energy of a wave is proportional to frequency and amplitude		
				277	standing waves on a string		
				278	wavelength of a standing wave		
				278	nodes and antinodes		
				278	modes of a wave		
				279	modes of vibration		
				279	vibration of a drum		
				280	microwaves and resonance		
				281	microwaves		
				281	use of microwaves in microwave ovens		
				282	describe relationship between wave characteristics		
				283	type of wave represented by a spring		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				283	analyze superimposed waves		
				284	superimpose two waves		
				284	which direction does a cork move on a water wave?		
				286	sound is a wave of pressure		
				286	sound waves require matter to traverse		
				286	properties of sound waves		
				287	frequency and pitch of sound		
				287	how we hear sound waves		
				287	the superposition of sound waves		
				288	loudness and decibels and the sensitivity of the ear		
				288	relationship of loudness and amplitude and pressure in sound wave		
				288	the decibel scale		
				289	acoustics		
				289	vibrations create sound		
				291	how we know sound is a wave		
				291	sound vibrates the eardrum		

Correlation to Nebraska Science Standards
Foundations of Physics
Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				291	pressure and amplitude of sound waves		
				292	importance of wavelength of sound waves		
				292	frequency and wavelengths of sound		
				292	sound is a longitudinal wave		
				293	definition of the Doppler effect		
				294	speed of sound in different materials		
				294	Doppler effect and supersonic and subsonic motion		
				294	effect of medium and temperature on speed of sound wave		
				295	resonance of sound		
				295	standing wave patterns of sound		
				295	designing a musical instrument		
				296	design of a good concert hall		
				296	interference of sound waves		
				297	Fourier's theorem and superposition principle and frequency spectrum		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				298	constructing meaning from sound		
				298	sonograms		
				299	how the ear works		
				300	pitch and frequency in music		
				300	music and sound		
				301	consonance and dissonance and beats		
				301	echolocation and beats		
				302	harmonics and frequency and the color of sound		
				302	musical instruments		
				303	design of a guitar		
				303	sound from a guitar		
				306	beats in a musical sound		
				306	list evidence that sound is a wave		
				307	applying superposition principle		
				307	understanding of Doppler effect		
				308	wave amplitude and harmonics of tuning fork and musical instrument		
				316	white light is the combination of all the colors		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				320	visible light has just the right energy for life		
				331	prisms separate white light into its colors		
				337	prisms and dispersion and rainbows		
				356	electromagnetic waves are oscillations of an energy field		
				359	waves of the electromagnetic spectrum		
				359	descriptions of radio waves and microwaves and infrared rays		
				360	visible light waves		
				360	x-rays and gamma rays		
				362	diffraction patterns and the spectrometer		
				363	polarization		
				364	polarizers		
				365	applications of polarization		
				452	MRI uses radio waves		
				530	absorption of thermal radiation		
				530	energy and radiation relationships		
				530	electromagnetic radiation		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				574	emission/absorption spectrum		
				575	spectral analysis of the sun		
				575	spectrum of hydrogen		
				638	Doppler effect and red shift		
				638	spectral-line patterns and red shift		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.6.1 9 - 12	Science and Technology	An understanding of science and technology establishes connections between the natural and designed world, linking science to technology.	students will develop an understanding of technological design.	42	writing procedures in a lab notebook helps make sure your results are repeatable	28	interpret setup diagram
				113	test and evaluate the prototype structure design	83	design and construct a pendulum
				113	build and test a prototype structure out of toothpicks	85	draw a sketch of your system
				113	conceptual design for a bridge	85	create a system that oscillates
				113	the engineering design cycle	92	sketch the wave fronts
				389	electrical devices are designed to operate at a certain voltage	122	communicate your findings
				543	evaluate three designs for a bridge	163	design and test different electric motors
				543	failure analysis in the design process	163	propose solutions that will work for each disk
						163	apply steps of the design cycle to building different electric motors
						164	evaluate the performance of motor designs
						167	suggest improvements you could make to the generator design
						173	designing and building logic circuits
						191	build an air-speed tester

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.6.2 9 - 12	Science and Technology	An understanding of science and technology establishes connections between the natural and designed world, linking science to technology.	students will develop an understanding about science and technology.	12	engineers design practical devices for solving problems		
				12	all technology is based on fundamental laws of physics		
				31	use of nanotechnology		
				31	use of nanotechnology		
				51	analyzing motion with video and strobe photography		
				72	antilock brakes application		
				72	antilock brakes application		
				112	designing a bridge		
				112	relationship between science and engineering and technology		
				138	use of robots		
				155	geostationary satellites		
				172	bicycle physics application		
				196	hydroelectric power application		
				196	hydroelectric power application		
				209	range of power for common devices		
				216	energy from ocean tides		
				217	research into tidal power		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				228	seat belts and air bags		
				235	jet engines application		
				235	jet engines application		
				243	oscillators are used in communications and music and clocks		
				257	quartz crystals application		
				257	quartz crystals application		
				263	waves can carry information		
				280	microwave ovens application		
				280	microwave ovens application		
				293	uses of Doppler radar		
				311	invention of electric light		
				325	the printing press		
				325	the printing press		
				349	the telescope		
				369	technological advances have allowed discovery of the expanding universe		
				372	holography application		
				378	importance of electricity		
				392	hybrid gas/electric cars application		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				392	hybrid gas/electric cars application		
				413	wiring application		
				413	wiring application		
				429	electron beam accelerators		
				434	how television works application		
				434	how television works application		
				451	MRI application		
				451	MRI application		
				472	maglev train application		
				473	how magplanes levitate		
				490	why computers are useful		
				492	computers and electronic addition of numbers application		
				516	refrigerator application		
				534	energy-efficient building application		
				534	energy-efficient building application		
				560	deep water submarine Alvin application		
				585	laser application		
				615	smoke detectors		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				623	creation of CAT scans		
				623	creation of CAT scans		
				631	nuclear power application		
				631	nuclear power application		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.7.1 9 - 12	Science in Personal and Social Perspectives	A personal and social perspective of science helps a student understand and act on personal and social issues. This perspective builds a foundation for future decision making.	students will develop an understanding of personal and community health.	219	using energy efficient products		
				392	hybrid cars combine advantages of gasoline fuel and electric power		
				392	environmental impact of auto pollution		
				534	energy-efficient building application		
				570	use of radioactive isotopes in medicine		
				604	balancing chemical equation of acid rain		
				607	impact of combustion reaction of gasoline		
				621	sources of radiation in the environment		
				621	human technology contributes to radiation in environment		
				622	x-ray machines		
				623	CAT scans		
				628	nuclear waste		
				632	nuclear energy		
				632	nuclear waste		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.7.4 9 - 12	Science in Personal and Social Perspectives	A personal and social perspective of science helps a student understand and act on personal and social issues. This perspective builds a foundation for future decision making.	students will develop an understanding of environmental quality.	219 392 392 534 604 607 621 621 628 632	using energy efficient products hybrid cars combine advantages of gasoline fuel and electric power environmental impact of auto pollution energy-efficient building application balancing chemical equation of acid rain impact of combustion reaction of gasoline sources of radiation in the environment human technology contributes to radiation in environment nuclear waste nuclear waste		
12.7.5 9 - 12	Science in Personal and Social Perspectives	A personal and social perspective of science helps a student understand and act on personal and social issues. This perspective builds a foundation for future decision making.	students will develop an understanding of natural and human-induced hazards.	570 621 622 623 632 632	use of radioactive isotopes in medicine sources of radiation in the environment x-ray machines CAT scans nuclear waste nuclear energy		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.7.6 9 - 12	Science in Personal and Social Perspectives	A personal and social perspective of science helps a student understand and act on personal and social issues. This perspective builds a foundation for future decision making.	students will develop an understanding of the role of science and technology in local, national, and global challenges.	52 62 91 92 188 292 372 576 621	Dr. Harold Edgerton and strobe photography acceleration of cars biomechanics application applications of biomechanics perpetual motion machines sound in space holograms and science fiction special effects ôtransporter beamsö UV radiation and thinning of ozone layer		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.8.1 9 - 12	History and Nature of Science	The history and nature of science illustrates different aspects of scientific inquiry, the human aspects of science, and the role that science has played in the development of various cultures.	students will develop an understanding of science as a human endeavor.	7	in science inquiry is used to uncover truth		
				52	Dr. Harold Edgerton and strobe photography		
				52	Dr. Harold Edgerton and strobe photography		
				91	biomechanics application		
				92	applications of biomechanics		
				155	first artificial human-made Earth satellite was Sputnik		
				178	Great Pyramid of Giza and simple machines		
				257	Pierre and Jacques Curie and the piezoelectric effect		
				269	wave motion and equilibrium		
				290	technological breakthrough of sound recording		
				310	past theories of light		
				325	history of printing		
				348	the usefulness of recorded images		
				349	the telescope		
				361	Young's double-slit experiment		
				368	Einstein's thinking revolutionized physics		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				440	scientists have never found single magnetic poles		
				447	discovering and using magnetism		
				501	search for elements and alchemy		
				560	deep water submarine Alvin application		
				561	the Alvin research submarine		
				568	understanding how gravity works inside atoms		
				575	discovery of helium		
				583	the meaning of the uncertainty principle		
				625	turning lead into gold		
				637	areas of active research in physics		
				640	unresolved questions of history of universe		
				641	research on future of the universe		
				641	research on future of the universe		
				644	proof of Einstein's theory of general relativity		
				645	astronomers find black holes by what is around them		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
-----------------------	---------------	----------	-----------	--------------------	--------	---------------------	--------

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.8.2 9 - 12	History and Nature of Science	The history and nature of science illustrates different aspects of scientific inquiry, the human aspects of science, and the role that science has played in the development of various cultures.	students will develop an understanding of the nature of scientific knowledge.	2	understanding natural laws	12	cause and effect relationships
				3	connecting cause and effect through observation	16	what do the results tell you?
				4	inquiry through observation	18	are the accelerations different?
				7	revising explanations through observation	19	does the ball accelerate?
				7	creating explanations through observation	43	test your prediction
				7	creating explanations through observation	43	what would happen if...?
				8	refining theories based on observations	58	explain why the angular acceleration is different
				8	forming hypotheses and testing with experiments	65	where does the marble move the fastest?
				8	Comparing a theory and a natural law	80	explain your observations
				8	testing hypotheses with experiments	87	explain how force applied causes the response
				9	connecting cause and effect through analysis	90	what effect does changing the tension have?
				10	the usefulness of phlogiston theory despite being incorrect	90	explain why higher tension makes waves move faster
				10	putting forth ideas and then testing them	92	explain how wind might cause big waves in water
				45	recognizing patterns and cause and effect relationships	109	explain how the colored filters work
				71	parachutes and air resistance	111	how does what you observed support the quantum theory?

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				136	determining formula for acceleration on a ramp	111	do your observations support this hypothesis?
				306	explain why hearing can be damaged by loud sounds	132	what conclusions can you draw?
				323	using glow-in-the-dark plastic to demonstrate photon energy levels	133	analyze data and explain a rule
				367	speed of light did not behave as expected for Michelson and Morley	147	how did A and B tapes acquire different charge?
				369	proof of time dilation	204	build models of Na and Cl and use them to explain bonding
				375	explain Thomas Young's demonstration of the wave nature of light		
				423	charge by friction		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
12.8.3 9 - 12	History and Nature of Science	The history and nature of science illustrates different aspects of scientific inquiry, the human aspects of science, and the role that science has played in the development of various cultures.	students will develop an understanding of the history of science.	52	Dr. Harold Edgerton and strobe photography	75	the discovery of atom's nucleus
				208	James Watt	122	research types of electromagnetic waves
				257	Pierre and Jacques Curie and the piezoelectric effect	147	Gilbert built the first electroscope
				311	Thomas Edison and the electric light		
				314	Einstein and the speed of light		
				316	Albert Einstein		
				361	Thomas Young		
				366	Albert Einstein's theory of special relativity		
				367	Albert A. Michelson and Edward R. Morley		
				400	Gustav Robert Kirchhoff		
				440	magnetism		
				447	history of magnetism		
				456	Hans Christian Oersted		
				472	Dr. D. Bruce Montgomery		
				499	development of atomic theory		
				499	Albert Einstein		
				499	Democritus		
				501	ancient Greeks' ideas of elements		
				574	Niels Bohr		

Correlation to Nebraska Science Standards

Foundations of Physics

Student Text and Investigation Manual

Standard #: Grades	Topic/Subject	Standard	Benchmark	student text pg	detail	investigation pg	detail
				575	Johann Balmer		
				578	Wolfgang Pauli		
				580	Max Planck and Albert Einstein		
				630	Wolfgang Pauli		
				644	proof of Einstein's theory of general relativity		
				647	Paul Dirac		