



Alignment Document
State of Nebraska and Aventa Learning Physics

Physics
2005-2007 Benchmark Blueprint

Goals	Standards	Benchmarks	Unit Name	Course Topic Description	
12.1 Unifying concepts and processes help students think about and integrate a range of basic ideas which builds an understanding of the natural world.	12.1.1 develop an understanding of systems, order, and organization.	12.1.1.A Predict and evaluate how change within a system affects that system.	Heat and Thermodynamics	Thermal Equilibrium Lab	
			Heat and Thermodynamics	Piston Lab	
			Magnetism and Atomic Physics	Magnetic Field of a Solenoid Lab	
		12.1.1.B Design solutions to problems identified within a system	Electricity	Circuits and Circuit Elements: Hybrid Vehicle Discussion	
	12.1.2 develop an understanding of evidence, models, and explanation.		12.1.2.A Create a physical, mental, or mathematical model to show how objects and processes are connected.	Heat and Thermodynamics	Thermal Equilibrium Lab
			12.1.2.B Test the usefulness of a model by comparing its predictions to actual observations.	Heat and Thermodynamics	Thermal Equilibrium Lab
			12.1.2.C Understand that the way data are displayed affects interpretation.		
			12.1.2.D Evaluate the reasonableness of answers to problems.	Covered in labs throughout the course	
		Physics and the Laws of Motion	Free-Fall Acceleration Lab		



		Physics and the Laws of Motion	Projectile Motion Lab
		Physics and the Laws of Motion	Forces and Friction Lab
		Energy and Motion	Conservation of Mechanical Energy Lab
		Energy and Motion	Momentum Lab
		Energy and Motion	Machines and Efficiency Lab
		Heat and Thermodynamics	Thermal Equilibrium Lab
		Heat and Thermodynamics	Piston Lab
		Heat and Thermodynamics	Simple Harmonic Motion Lab
		Waves	Wave Lab
		Waves	Sound Lab
		Waves	Converging Lenses Lab
		Electricity	Electrostatics Lab
		Electricity	Current and Resistance Lab
		Electricity	Resistors in Series and Parallel Lab
		Magnetism and Atomic Physics	Magnetic Field of a Solenoid Lab

			Magnetism and Atomic Physics	Electromagnetic Induction Lab
			Magnetism and Atomic Physics	Photoelectric Effect Lab
		12.1.2.E Understand that larger well-chosen samples produce more accurate estimates of the characteristics of the total population.		
		12.1.2.F Understand that a correlation between two variables doesn't mean that either one causes the other.		
	12.1.3 develop an understanding of change, constancy, and measurement.	12.1.3.A Use powers of ten to represent large and small numbers.	Waves	Light
Electricity			Electric Forces and Fields	
Magnetism and Atomic Physics		Atomic Physics		
12.1.3.B Compare data for two groups by using averages and ranges of values.		Physics and the Laws of Motion	Free Fall Acceleration Lab	
		Physics and the Laws of Motion	Projectile Motion Lab	
	Magnetism and Atomic Physics	Photoelectric Effect Lab		
12.1.3.C Understand that measurement errors may affect results of calculations.	Covered in labs throughout the course			
	Physics and the Laws of Motion	Free-Fall Acceleration Lab		
	Physics and the Laws of Motion	Projectile Motion Lab		



			Physics and the Laws of Motion Energy and Motion	Forces and Friction Lab
			Energy and Motion	Conservation of Mechanical Energy Lab
			Energy and Motion	Momentum Lab
			Energy and Motion	Machines and Efficiency Lab
			Heat and Thermodynamics	Thermal Equilibrium Lab
			Heat and Thermodynamics	Piston Lab
			Heat and Thermodynamics	Simple Harmonic Motion Lab
			Waves	Wave Lab
			Waves	Sound Lab
			Waves	Converging Lenses Lab
			Electricity	Electrostatics Lab
			Electricity	Current and Resistance Lab
			Electricity	Resistors in Series and Parallel Lab
			Magnetism and Atomic Physics	Magnetic Field of a Solenoid Lab

			Magnetism and Atomic Physics	Electromagnetic Induction Lab
			Magnetism and Atomic Physics	Photoelectric Effect Lab
		12.1.3.D Describe rate of change by comparing one measured quantity to another measured quantity.	Physics and the Laws of Motion	Free-Fall Acceleration Lab
			Physics and the Laws of Motion	Projectile Motion Lab
		12.1.3.E Investigate and describe how different characteristics, properties, or relationships within a system change as their dimensions increase or decrease.	Heat and Thermodynamics	Piston Lab
	12.1.4 develop an understanding of form and function.	12.1.4.A Explain function by referring to form and explain form by referring to function.		
	12.1.5 develop an understanding of change over a period of time.	12.1.5.A Identify the series of changes that occur in objects, organisms, and natural and human designed systems.		
		12.1.5.B Explain how a system at equilibrium is affected by change.	Heat and Thermodynamics	Piston Lab
			Heat and Thermodynamics	Thermal Equilibrium Lab
12.2 Science as inquiry requires students to combine processes and scientific knowledge with scientific reasoning and critical thinking to develop their understanding of science.	12.2.1 develop the abilities needed to do scientific inquiry.	12.2.1.A Formulate questions and identify concepts that guide scientific investigations.	Covered in labs throughout the course	
			Physics and the Laws of Motion	Free-Fall Acceleration Lab
			Physics and the Laws of Motion	Projectile Motion Lab
			Physics and the	Forces and Friction Lab



			Laws of Motion	
			Energy and Motion	Conservation of Mechanical Energy Lab
			Energy and Motion	Momentum Lab
			Energy and Motion	Machines and Efficiency Lab
			Heat and Thermodynamics	Thermal Equilibrium Lab
			Heat and Thermodynamics	Piston Lab
			Heat and Thermodynamics	Simple Harmonic Motion Lab
			Waves	Wave Lab
			Waves	Sound Lab
			Waves	Converging Lenses Lab
			Electricity	Electrostatics Lab
			Electricity	Current and Resistance Lab
			Electricity	Resistors in Series and Parallel Lab
			Magnetism and Atomic Physics	Magnetic Field of a Solenoid Lab
			Magnetism and Atomic Physics	Electromagnetic Induction Lab



			Magnetism and Atomic Physics	Photoelectric Effect Lab
		12.2.1.B Design and conduct scientific investigations.	Covered in labs throughout the course	
			Physics and the Laws of Motion	Free-Fall Acceleration Lab
			Physics and the Laws of Motion	Projectile Motion Lab
			Physics and the Laws of Motion Energy and Motion	Forces and Friction Lab
			Energy and Motion	Conservation of Mechanical Energy Lab
			Energy and Motion	Momentum Lab
			Energy and Motion	Machines and Efficiency Lab
			Heat and Thermodynamics	Thermal Equilibrium Lab
			Heat and Thermodynamics	Piston Lab
			Heat and Thermodynamics	Simple Harmonic Motion Lab
			Waves	Wave Lab
			Waves	Sound Lab
			Waves	Converging Lenses Lab



			Electricity	Electrostatics Lab
			Electricity	Current and Resistance Lab
			Electricity	Resistors in Series and Parallel Lab
			Magnetism and Atomic Physics	Magnetic Field of a Solenoid Lab
			Magnetism and Atomic Physics	Electromagnetic Induction Lab
			Magnetism and Atomic Physics	Photoelectric Effect Lab
		12.2.1.C Use technology and mathematics to improve investigations and communications.	Covered in labs throughout the course	
			Physics and the Laws of Motion	Free-Fall Acceleration Lab
			Physics and the Laws of Motion	Projectile Motion Lab
			Physics and the Laws of Motion	Forces and Friction Lab
			Energy and Motion	Conservation of Mechanical Energy Lab
			Energy and Motion	Momentum Lab
			Energy and Motion	Machines and Efficiency Lab
			Heat and	Thermal Equilibrium Lab

		Thermodynamics	
		Heat and Thermodynamics	Piston Lab
		Heat and Thermodynamics	Simple Harmonic Motion Lab
		Waves	Wave Lab
		Waves	Sound Lab
		Waves	Converging Lenses Lab
		Electricity	Electrostatics Lab
		Electricity	Current and Resistance Lab
		Electricity	Resistors in Series and Parallel Lab
		Magnetism and Atomic Physics	Magnetic Field of a Solenoid Lab
		Magnetism and Atomic Physics	Electromagnetic Induction Lab
		Magnetism and Atomic Physics	Photoelectric Effect Lab
	12.2.1.D Formulate and revise scientific explanations and models using logic and evidence.	Magnetism and Atomic Physics	Electromagnetic Induction Lab
		Magnetism and Atomic Physics	Photoelectric Effect Lab
	12.2.1.E Recognize and analyze alternative explanations and models.	Magnetism and Atomic Physics	Electromagnetic Induction: High Voltage Discussion

		12.2.1.F Communicate and defend a scientific argument.	Electricity	Circuits and Circuit Elements: Hybrid Vehicle Discussion	
12.3 Physical science focuses on science facts, concepts, principles, theories, and models that are important for all students to know, understand, and use.	12.3.1 develop an understanding of the structure of the atom.	2.3.1.A Investigate and describe the structure of atoms, focusing on properties of subatomic particles.	Electricity	Electrostatics Lab	
		12.3.1.B Investigate and explain the types of nuclear reactions.			
		12.3.1.C Investigate and describe the effect of electrical and nuclear forces which hold atoms together.			
	12.3.2 develop an understanding of the structure and properties of matter.		12.3.2.A Investigate and understand that atoms interact with one another by transferring or sharing electrons.	Electricity	Electrostatics Lab
			12.3.2.B Investigate and explain the periodic table of elements in terms of repeating patterns of physical and chemical properties.		
			12.3.2.C Investigate and describe how the structure of an atom determines the chemical properties of an element.		
			12.3.2.D Investigate and explain how the interactions among the molecules of a compound determine its physical and chemical properties.		
			12.3.2.D Investigate and use changes in energy to explain the differences among the states of matter.	Heat and Thermodynamics	Heat
	12.3.3 develop an understanding of chemical reactions.		12.3.3.A Investigate and describe common chemical reactions.		
			12.3.3.B Investigate and describe the change of energy as a result of chemical reactions.		

		12.3.3.C Investigate and describe how electrons are involved in bond formation during chemical reactions.		
		12.3.3.D Investigate and describe the factors influencing the rates of chemical reactions, including catalysts.		
12.3.4 develop an understanding of motions and forces.	12.3.4.A Investigate and understand the effect of forces on the motion of objects.	Physics and the Laws of Motion	Physics and the Laws of Motion	Forces and the Laws of Motion Forces and Friction Lab
	12.3.4.B Investigate and understand gravity as an attractive force that each mass exerts on any other mass.	Physics and the Laws of Motion	Physics and the Laws of Motion	Free Fall Acceleration Lab Projectile Motion Lab
	12.3.4.C Investigate and understand electrical force as a force that exists between any two charged objects.	Electricity	Electricity	Electric Forces and Fields Electrostatics Lab
	12.3.4.D Investigate and describe an electric field, a magnetic field, and the interaction between them.	Magnetism and Atomic Physics	Magnetism and Atomic Physics	Electromagnetic Induction
	12.3.5 develop an understanding of the conservation of energy and increase in disorder.	12.3.5.A Understand that the total energy in the universe is constant and can never be destroyed.	Energy and Motion	Energy and Motion
	12.3.5.B Investigate and distinguish between kinetic energy and potential energy.	Energy and Motion	Energy and Motion	Heat Thermal Equilibrium Lab
	12.3.5.C Investigate and describe heat transfer in terms of conduction, convection, and radiation.	Heat and Thermodynamics	Heat and Thermodynamics	Thermodynamics
	12.3.5.D Investigate and give examples of how systems tend to become more disorderly over time.	Heat and Thermodynamics	Heat and Thermodynamics	

	12.3.6 develop an understanding of the interactions of energy and matter.	12.3.6.A Investigate and understand that all waves possess and transfer energy.	Waves Waves	Vibrations and Waves Wave Lab
		12.3.6.B Understand that electromagnetic waves result when a charged object accelerates.	Magnetism and Atomic Physics	Electromagnetic Induction
		12.3.6.C Investigate and illustrate how wavelength and frequency of waves are inversely related.	Waves Waves	Vibrations and Waves Wave Lab
		12.3.6.D Investigate and understand that the energy of waves can be changed into other forms of energy, just as other forms of energy can be transformed into wave energy.	Waves Waves	Sound Sound Lab
		12.3.6.E Investigate and understand that atoms or molecules can be identified by spectral analysis.	Magnetism and Atomic Physics	Atomic Physics
		12.3.6.F Investigate and describe how the composition and temperature of a material affect electron flow.	Electricity Electricity	Electrical Energy and Current Current and Resistance
12.6 An understanding of science and technology establishes connections between the natural and designed world, linking science and technology.	12.6.1 develop an understanding of technological design.	12.6.1.A Propose designs and choose between alternative solutions of a problem.	Electricity	Circuits and Circuit Elements: Hybrid Vehicle Discussion
		12.6.1.B Implement the selected solution.		
		12.6.1.C Evaluate the solution and its consequences.		
	12.6.2 develop an understanding about science and technology.	12.6.1.D Communicate the problem, process, and solution.		
		12.6.2.A Explain how science advances with the introduction of new technology.		
		12.6.2.B Understand creativity, imagination, and a good knowledge base are all needed to advance the work of science and engineering.	Magnetism and Atomic Physics	Atomic Physics
	12.6.2.C Contrast the reasons for the pursuit of science and the pursuit of			

		technology.		
		12.6.2.D Contrast the reporting of scientific knowledge and the reporting of technical knowledge.		
12.7 A personal and social perspective of science helps a student to understand and act on personal and social issues. This perspective builds a foundation for future decision making.	12.7.1 develop an understanding of personal and community health.	12.7.1.A Investigate and describe the effect of nutritional balance on growth, development, and personal well-being.		
		12.7.1.B Investigate and explain how diseases are prevented, controlled, and cured.		
		12.7.1.C Investigate and explain how genetic traits affect a person's health.		
		12.7.1.D Investigate and analyze risks and benefits in making decisions about personal and community health.		
	12.7.2 develop an understanding of the effects of population change.	12.7.2.A Investigate and identify causes of population growth or decline.		
		12.7.2.B Investigate and explain how various factors influence birth rates and death rates.		
		12.7.2.C Investigate and predict how population change may impact resource use and environments.		
	12.7.3 develop an understanding of natural resources.	12.7.3.A Investigate and explain how human populations use environmental resources to maintain and improve their existence.		
		12.7.3.B Investigate and understand that the earth has renewable and finite resources.		
		12.7.3.C Investigate and understand the limitations of natural systems to renew and recycle resources.		
	12.7.4 develop an understanding of environmental quality.	12.7.4.A Investigate and describe how the positive and negative consequences of human intervention or nonintervention		

		impact the ecosystem.		
		12.7.4.B Investigate and explain factors which may influence environmental quality.		
	12.7.5 develop an understanding of natural and human-induced hazards.	12.7.5.A Investigate and describe how human activities increase or reduce the potential for hazards.		
		12.7.5.B Investigate and distinguish between slowly and rapidly occurring natural hazards and their impact on the environment.		
	12.7.6 develop an understanding of the role of science and technology in local, national, and global challenges.	12.7.6.A Understand that knowledge of basic concepts about scientific and technological challenges should precede active debate.		
		12.7.6.B Investigate and understand that social issues and challenges may affect advancements in science and technology.		
		12.7.6.C Understand that science and technology are essential social enterprises that indicate what could happen, but not what should happen.		
12.8 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.	12.8.1 develop an understanding of science as a human endeavor.	12.8.1.A Demonstrate ethical scientific practices (e.g., informing research subjects about risks and benefits, humane treatment of animals, truthful reporting, public disclosure of work, and peer review).		
		12.8.1.B Examine and understand the societal, cultural, and personal beliefs that influence scientists		
		12.8.1.C Recognize science as one way of answering questions and explaining the natural world.		
	12.8.2 develop an understanding of the nature of scientific knowledge.	12.8.2.A Demonstrate the use of empirical standards, logical arguments, and		

		skepticism in science		
		12.8.2.B Create scientific explanations consistent with experimental and observational evidence; make accurate predictions; strive to be logical; respect the rules of evidence; accept criticism; report methods and procedures; and make knowledge public.		
		12.8.2.C Understand that all scientific knowledge is, in principle, subject to change as new evidence becomes available.		
	12.8.3 develop an understanding of the history of science.	12.8.3.A Investigate and describe the contributions of diverse cultures to scientific knowledge and technological inventions.		
		12.8.3.B Understand that changes in scientific knowledge evolve over time and almost always build on earlier knowledge.		
		12.8.3.C Understand that some advancements in science and technology have long-lasting effects on society.		