



Alignment Document  
State of South Dakota and Aventa Learning Physics

**Physics**

Goals	Indicators	Standards	Unit Name	Course Topic Description
1 Students will explore, evaluate, and communicate personal and scientific investigations to understand the nature of science.	1.1 Understand the nature and origin of scientific knowledge.	9-12.N.1.1 Students are able to evaluate a scientific discovery to determine and describe how societal, cultural, and personal beliefs influence scientific investigations and interpretations.		
		9-12.N.1.1.a Recognize scientific knowledge is not merely a set of static facts but is dynamic and affords the best current explanations.	Introduction to Modern Physics	Atomic Physics
			Introduction to Modern Physics	Atomic Models
			Introduction to Modern Physics	Special Theory of Relativity
		9-12.N.1.1.b Discuss how progress in science can be affected by social issues.		
		9-12.N.1.2 Students are able to describe the role of observation and evidence in the development and modification of hypotheses, theories, and laws.		
		9-12.N.1.2.a Research, communicate, and support a scientific argument.		
		9-12.N.1.2.b Recognize and analyze alternative explanations and models.		



		<b>9-12.N.1.2.c</b> Evaluate the scientific accuracy of information relevant to a specific issue (pseudo-science).		
	<b>1.2</b> Apply the skills necessary to conduct scientific investigations.	<b>9-12.N.2.1</b> Students are able to apply science process skills to design and conduct student investigations.	Covered in labs throughout the course  Physics and the Laws of Motion  Physics and the Laws of Motion  Physics and the Laws of Motion  Energy and Motion  Energy and Motion  Energy and Motion  Heat and Thermodynamics  Heat and Thermodynamics  Waves  Waves  Waves  Waves  Electrostatics	Free-Fall Lab  Projectile Motion Lab  Forces and Friction Lab  Conservation of Mechanical Energy Lab  Momentum Lab  Machines and Efficiency Lab  Thermal Equilibrium Lab  Piston Lab  Simple Harmonic Motion Lab  Wave Lab  Sound Lab  Converging Lenses Lab  Electrostatics Lab



			Electrostatics	Charges and Fields Lab
			Electric Current	Ohm's Law Lab
			Electric Current	Ohm's Law and Factors Affecting Resistance Lab
			Electric Current	Resistors in Series and Parallel Lab
			Magnetism	Magnetic Field of a Solenoid Lab
			Magnetism	Electromagnetic Induction Lab
			Introduction to Modern Physics	Photoelectric Effect Lab
		<b>9-12.N.2.1.a</b> Identify the questions and concepts to guide the development of hypotheses.	Covered in labs throughout the course	
			Physics and the Laws of Motion	Free-Fall 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
			Waves	Simple Harmonic Motion Lab
			Waves	Wave Lab
			Waves	Sound Lab
			Waves	Converging Lenses Lab
			Electrostatics	Electrostatics Lab
			Electrostatics	Charges and Fields Lab
			Electric Current	Ohm's Law Lab
			Electric Current	Ohm's Law and Factors Affecting Resistance Lab
			Electric Current	Resistors in Series and Parallel Lab
			Magnetism	Magnetic Field of a Solenoid Lab
			Magnetism	Electromagnetic Induction Lab
			Introduction to Modern Physics	Photoelectric Effect Lab
		<b>9-12.N.2.1.b</b> Analyze primary sources of information to guide the development of the procedure.		
		<b>9-12.N.2.1.c</b> Select and use appropriate	Covered in labs	



		instruments to extend observations and measurements.	throughout the course	
			Physics and the Laws of Motion	Free-Fall 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
			Waves	Simple Harmonic Motion Lab
			Waves	Wave Lab
			Waves	Sound Lab
			Waves	Converging Lenses Lab
			Electrostatics	Electrostatics Lab
			Electrostatics	Charges and Fields Lab
			Electric Current	Ohm's Law Lab



			Electric Current	Ohm's Law and Factors Affecting Resistance Lab
			Electric Current	Resistors in Series and Parallel Lab
			Magnetism	Magnetic Field of a Solenoid Lab
			Magnetism	Electromagnetic Induction Lab
			Introduction to Modern Physics	Photoelectric Effect Lab
		<b>9-12.N.2.1.d</b> Revise explanations and models based on evidence and logic.	Covered in labs throughout the course	
			Physics and the Laws of Motion	Free-Fall 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	Piston Lab



			Thermodynamics	
			Waves	Simple Harmonic Motion Lab
			Waves	Wave Lab
			Waves	Sound Lab
			Waves	Converging Lenses Lab
			Electrostatics	Electrostatics Lab
			Electrostatics	Charges and Fields Lab
			Electric Current	Ohm's Law Lab
			Electric Current	Ohm's Law and Factors Affecting Resistance Lab
			Electric Current	Resistors in Series and Parallel Lab
			Magnetism	Magnetic Field of a Solenoid Lab
			Magnetism	Electromagnetic Induction Lab
			Introduction to Modern Physics	Photoelectric Effect Lab
		<b>9-12.N.2.1.e</b> Use technology and mathematic skills to enhance investigations, communicate results, and defend conclusions.	Covered in labs throughout the course	
			Physics and the Laws of Motion	Free-Fall 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
			Waves	Simple Harmonic Motion Lab
			Waves	Wave Lab
			Waves	Sound Lab
			Waves	Converging Lenses Lab
			Electrostatics	Electrostatics Lab
			Electrostatics	Charges and Fields Lab
			Electric Current	Ohm's Law Lab
			Electric Current	Ohm's Law and Factors Affecting Resistance Lab
			Electric Current	Resistors in Series and Parallel Lab

			Magnetism	Magnetic Field of a Solenoid Lab
			Magnetism	Electromagnetic Induction Lab
			Introduction to Modern Physics	Photoelectric Effect Lab
		<b>9-12.N.2.2</b> Students are able to practice safe and effective laboratory techniques.		
		<b>9-12.N.2.2.a</b> Handle hazardous materials properly.		
		<b>9-12.N.2.2.b</b> Use safety equipment correctly.		
		<b>9-12.N.2.2.c</b> Practice emergency procedure.		
		<b>9-12.N.2.2.d</b> Wear appropriate attire.		
		<b>9-12.N.2.2.e</b> Practice safe behaviors.		
<b>2</b> Students will use appropriate scientific models to describe and quantify the nature and interactions of matter and energy.	<b>2.1</b> Describe structures and properties of, and changes in, matter.	<b>9-12.P.1.1</b> Students are able to use the Periodic Table to determine the atomic structure of elements, valence number, family relationships, and regions (metals, nonmetals, and metalloids).		
		<b>9-12.P.1.1.a</b> Determine protons, neutrons, electrons, mass number, and atomic number from the Periodic Table.		
		<b>9-12.P.1.1.b</b> Determine the number of valence electrons for elements in the main (s&p) blocks of the Periodic Table.		
		<b>9-12.P.1.1.c</b> Identify the relative metallic character of an element based on its location on the Periodic Table.		
		<b>9-12.P.1.2</b> Students are able to describe ways that atoms combine.		
		<b>9-12.P.1.2.a</b> Name and write formulas		

		for binary ionic and covalent compounds.		
		<b>9-12.P.1.2.b</b> Compare the roles of electrons in covalent, ionic, and metallic bonding.		
		<b>9-12.P.1.2.c</b> Discuss the special nature of carbon covalent bonds.		
		<b>9-12.P.1.3</b> Students are able to predict whether reactions will speed up or slow down as conditions change.		
		<b>9-12.P.1.4</b> Students are able to balance chemical equations by applying the Law of Conservation of Matter.		
		<b>9-12.P.1.4.a</b> Trace number of particles in diagrams and pictures of balanced equations.		
		<b>9-12.P.1.5</b> Students are able to distinguish among chemical, physical, and nuclear changes.		
		<b>9-12.P.1.5.a</b> Differentiate between physical and chemical properties used to describe matter.		
		<b>9-12.P.1.5.b</b> Identify key indicators of chemical and physical changes.		
		<b>9-12.P.1.5.c</b> Describe the effects of changing pressure, volume, or temperature upon gases.		
		<b>9-12.P.1.5.d</b> Identify characteristics of a solution and factors that affect the rate of solution formation.		
		<b>9-12.P.1.5.e</b> Explain the differences among nuclear, chemical, and physical changes at the atomic level.		
	<b>2.2</b> Analyze forces, their forms, and their effects on motions.	<b>9-12.P.2.1</b> Students are able to apply concepts of distance and time to the quantitative relationships of motion	Physics and the Laws of Motion	Motion in One Dimension

		using appropriate mathematical formulas, equations, and units.	Physics and the Laws of Motion Physics and the Laws of Motion Physics and the Laws of Motion	Two Dimensional Motion and Vectors Free-Fall Acceleration Lab Projectile Motion Lab
		<b>9-12.P.2.1.a</b> Evaluate speed, velocity, and acceleration both qualitatively and quantitatively.	Physics and the Laws of Motion Physics and the Laws of Motion Physics and the Laws of Motion Physics and the Laws of Motion	Motion in One Dimension Two Dimensional Motion and Vectors Free-Fall Acceleration Lab Projectile Motion Lab
		<b>9-12.P.2.1.b</b> Given distance and time, calculate the velocity or speed of an object.	Physics and the Laws of Motion Physics and the Laws of Motion Physics and the Laws of Motion Physics and the Laws of Motion	Motion in One Dimension Two Dimensional Motion and Vectors Free-Fall Acceleration Lab Projectile Motion Lab
		<b>9-12.P.2.1.c</b> Create and interpret graphs of linear motion.	Physics and the Laws of Motion Physics and the Laws of Motion	Free-Fall Acceleration Lab Unit Exam
		<b>9-12.P.2.1.d</b> Distinguish between	Physics and the Laws	Forces and the Laws of Motion

	velocity and acceleration as related to force.	of Motion	
	<b>9-12.P.2.2</b> Students are able to predict motion of an object using Newton's Laws.	Physics and the Laws of Motion	Forces and the Laws of Motion
	<b>9-12.P.2.2.a</b> Describe how inertia is related to Newton's First Law.	Physics and the Laws of Motion Physics and the Laws of Motion	Forces and Friction Lab Unit Exam
	<b>9-12.P.2.2.b</b> Explain the effect of balanced and unbalanced forces.	Physics and the Laws of Motion Physics and the Laws of Motion	Forces and Friction Lab Unit Exam
	<b>9-12.P.2.2.c</b> Identify the forces at work on action/reaction pairs as distinguished from balanced forces.	Physics and the Laws of Motion Physics and the Laws of Motion	Forces and Friction Lab Unit Exam
	<b>9-12.P.2.2.d</b> Explain how force, mass, and acceleration are related.	Physics and the Laws of Motion Physics and the Laws of Motion	Forces and Friction Lab Unit Exam
	<b>9-12.P.2.3</b> Students are able to relate concepts of force, distance, and time to the quantitative relationships of work, energy, and power.	Energy and Motion Energy and Motion Energy and Motion Energy and Motion	Work and Energy Conservation of Mechanical Energy Lab Momentum Lab Unit Exam
	<b>9-12.P.2.3.a</b> Apply appropriate mathematical formulas and equations to concepts using appropriate units.	Energy and Motion Energy and Motion	Work and Energy Conservation of Mechanical

			Energy and Motion	Energy Lab
			Energy and Motion	Momentum Lab
			Energy and Motion	Unit Exam
	<b>2.3</b> Analyze interactions of energy and matter.	<b>9-12.P.3.1</b> Students are able to describe the relationships among potential energy, kinetic energy, and work as applied to the Law of Conservation of Energy.	Energy and Motion	Conservation of Mechanical Energy Lab
			Energy and Motion	Momentum Lab
		<b>9-12.P.3.1.a</b> Describe how energy can be transferred and transformed to produce useful work.	Energy and Motion	Conservation of Mechanical Energy Lab
			Energy and Motion	Momentum Lab
		<b>9-12.P.3.1.b</b> Given the formulas, calculate the mechanical advantage and efficiency of selected systems.	Energy and Motion	Machines and Efficiency Lab
		<b>9-12.P.3.1.c</b> Explain methods of heat transfer.	Heat and Thermodynamics	Heat
			Heat and Thermodynamics	Unit Exam
		<b>9-12.P.3.2</b> Students are able to describe how characteristics of waves are related to one another.	Waves	Wave Lab
			Waves	Unit Exam
		<b>9-12.P.3.2.a</b> Relate wavelength, speed, and frequency ( $v=f$ ).	Waves	Wave Lab
		Waves	Sound Lab	
		Waves	Unit Exam	
	<b>9-12.P.3.2.b</b> Distinguish between transverse and longitudinal waves.	Waves	Waves in Elastic Medium and Sound	
		Waves	Unit Exam	
	<b>9-12.P.3.3</b> Students are able to describe electrical effects in terms of	Electric Current	Current and Resistance	

		motion and concentrations of charged particles.	Electric Current	Ohm's Law Lab
		<b>9-12.P.3.3.a</b> Relate potential difference to current.	Electric Current	Current and Resistance
			Electric Current	Ohm's Law Lab
		<b>9-12.P.3.3.b</b> Describe how static electricity is different from current electricity.		
		<b>9-12.P.3.3.c</b> Interpret and apply Ohm's Law.	Electric Current	Current and Resistance
			Electric Current	Ohm's Law Lab
		<b>9-12.P.3.3.d</b> Describe electrical attractions and repulsions.	Electrostatics	Charges and Fields Lab
		<b>9-12.P.3.3.e</b> Describe how magnetism originates from motion of charged particles.	Magnetism	Magnetic Field of a Solenoid Lab
<b>5</b> Students will identify and evaluate the relationships and ethical implications of science upon technology, environment, and society.	<b>5.1</b> Analyze various implications/effects of scientific advancement within the environment and society.	<b>9-12.S.1.1</b> Students are able to explain ethical roles and responsibilities of scientists and scientific research.		
		<b>9-12.S.1.2</b> Students are able to evaluate and describe the impact of scientific discoveries on historical events and social, economic, and ethical issues.		
	<b>5.2</b> Analyze the relationships/interactions among science, technology, environment, and society.	<b>9-12.S.2.1</b> Students are able to describe immediate and long-term consequences of potential solutions for technological issues.	Waves	Waves in Elastic Medium and Sound
		<b>9-12.S.2.1.a</b> Describe how the pertinent technological system operates.		
		<b>9-12.S.2.2</b> Students are able to analyze factors that could limit technological design.		
		<b>9-12.S.2.3</b> Students are able to analyze and describe the benefits, limitations, cost, and consequences involved in		



		using, conserving, or recycling resources.		
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