



Alignment Document
State of South Dakota and Aventa Learning Chemistry

Chemistry

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.	Scientific Method	The Scientific Method
		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.	Covered in labs throughout the course	
		9-12.N.1.2.b Recognize and analyze alternative explanations and models.	Covered in labs throughout the course	

		9-12.N.1.2.c Evaluate the scientific accuracy of information relevant to a specific issue (pseudo-science).		
1.2 Apply the skills necessary to conduct scientific investigations.		9-12.N.2.1 Students are able to apply science process skills to design and conduct student investigations.		
		9-12.N.2.1.a Identify the questions and concepts to guide the development of hypotheses.	Scientific Method Covered in labs throughout the course	The Scientific Method
		9-12.N.2.1.b Analyze primary sources of information to guide the development of the procedure.		
		9-12.N.2.1.c Select and use appropriate instruments to extend observations and measurements.	Covered in labs throughout the course	
		9-12.N.2.1.d Revise explanations and models based on evidence and logic.	Covered in labs throughout the course	
		9-12.N.2.1.e Use technology and mathematic skills to enhance investigations, communicate results, and defend conclusions.	Covered in labs throughout the course	
		9-12.N.2.2 Students are able to practice safe and effective laboratory techniques.		
		9-12.N.2.2.a Handle hazardous materials properly.		
		9-12.N.2.2.b Use safety equipment correctly.		
		9-12.N.2.2.c Practice emergency procedure.		

		9-12.N.2.2.d Wear appropriate attire.		
		9-12.N.2.2.e Practice safe behaviors.		
2 Students will use appropriate scientific models to describe and quantify the nature and interactions of matter and energy.	2.1 Describe structures and properties of, and changes in, matter.	9-12.P.1.1 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).		
		9-12.P.1.1.a Determine protons, neutrons, electrons, mass number, and atomic number from the Periodic Table.	Atoms/Periodic Table	Atomic Number, Mass Number, and Isotopes
		9-12.P.1.1.b Determine the number of valence electrons for elements in the main (s&p) blocks of the Periodic Table.	Ionic Compounds	Ionic and Covalent Compounds
		9-12.P.1.1.c Identify the relative metallic character of an element based on its location on the Periodic Table.	Atoms/Periodic Table	History of the Periodic Table
		9-12.P.1.2 Students are able to describe ways that atoms combine.	Ionic Compounds	Ionic and Covalent Compounds
		9-12.P.1.2.a Name and write formulas for binary ionic and covalent compounds.	Ionic Compounds	Ionic and Covalent Compounds
		9-12.P.1.2.b Compare the roles of electrons in covalent, ionic, and metallic bonding.	Ionic Compounds	Ionic and Covalent Compounds
		9-12.P.1.2.c Discuss the special nature of carbon covalent bonds.	Ionic Compounds	Ionic and Covalent Compounds

	9-12.P.1.3 Students are able to predict whether reactions will speed up or slow down as conditions change.	Reactions Rates an	Kinetics
	9-12.P.1.4 Students are able to balance chemical equations by applying the Law of Conservation of Matter.	Chemical Reactions	What is a Chemical Reaction
	9-12.P.1.4.a Trace number of particles in diagrams and pictures of balanced equations.	Chemical Reactions	What is a Chemical Reaction
	9-12.P.1.5 Students are able to distinguish among chemical, physical, and nuclear changes.	Chemistry Fundamentals	Physical Change
		Chemistry Fundamentals	Chemical Change
		Nuclear Chemistry	Nuclear Reactions
	9-12.P.1.5.a Differentiate between physical and chemical properties used to describe matter.	Chemistry Fundamentals	Chemical Versus Physical Properties
	9-12.P.1.5.b Identify key indicators of chemical and physical changes.	Chemistry Fundamentals	Physical Change
		Chemistry Fundamentals	Chemical Change
	9-12.P.1.5.c Describe the effects of changing pressure, volume, or temperature upon gases.	Solids, Liquids, and Gases	Understanding the Gas Laws
	9-12.P.1.5.d Identify characteristics of a solution and factors that affect the rate of solution formation.	Water, Solutions	The Solution Process
	9-12.P.1.5.e Explain the differences among nuclear, chemical, and physical changes at the atomic level.	Chemistry Fundamentals	Physical Change
		Chemistry Fundamentals	Chemical Change
		Nuclear Chemistry	Nuclear Reactions

	<p>2.2 Analyze forces, their forms, and their effects on motions.</p>	<p>9-12.P.2.1 Students are able to apply concepts of distance and time to the quantitative relationships of motion using appropriate mathematical formulas, equations, and units.</p>		
		<p>9-12.P.2.1.a Evaluate speed, velocity, and acceleration both qualitatively and quantitatively.</p>		
		<p>9-12.P.2.1.b Given distance and time, calculate the velocity or speed of an object.</p>		
		<p>9-12.P.2.1.c Create and interpret graphs of linear motion.</p>		
		<p>9-12.P.2.1.d Distinguish between velocity and acceleration as related to force.</p>		
		<p>9-12.P.2.2 Students are able to predict motion of an object using Newton's Laws.</p>		
		<p>9-12.P.2.2.a Describe how inertia is related to Newton's First Law.</p>		
		<p>9-12.P.2.2.b Explain the effect of balanced and unbalanced forces.</p>		
		<p>9-12.P.2.2.c Identify the forces at work on action/reaction pairs as distinguished from balanced forces.</p>		
		<p>9-12.P.2.2.d Explain how force, mass, and acceleration are related.</p>		
		<p>9-12.P.2.3 Students are able to relate concepts of force, distance, and time to the quantitative relationships of work, energy, and power.</p>		

		9-12.P.2.3.a Apply appropriate mathematical formulas and equations to concepts using appropriate units.	Solids, Liquids, and Gases	Understanding The Gas Laws
2.3 Analyze interactions of energy and matter.		9-12.P.3.1 Students are able to describe the relationships among potential energy, kinetic energy, and work as applied to the Law of Conservation of Energy.	Thermodynamics Thermodynamics	Thermodynamics Conservation of Energy - Calorimetry
		9-12.P.3.1.a Describe how energy can be transferred and transformed to produce useful work.	Thermodynamics	Thermodynamics
		9-12.P.3.1.b Given the formulas, calculate the mechanical advantage and efficiency of selected systems.		
		9-12.P.3.1.c Explain methods of heat transfer.	Thermodynamics	Thermodynamics
		9-12.P.3.2 Students are able to describe how characteristics of waves are related to one another.		
		9-12.P.3.2.a Relate wavelength, speed, and frequency ($v=f$).		
		9-12.P.3.2.b Distinguish between transverse and longitudinal waves.		
		9-12.P.3.3 Students are able to describe electrical effects in terms of motion and concentrations of charged particles.	Water, Solutions	The Solution Process
		9-12.P.3.3.a Relate potential difference to current.		
		9-12.P.3.3.b Describe how static electricity is different from current electricity.		

		9-12.P.3.3.c Interpret and apply Ohm's Law.		
		9-12.P.3.3.d Describe electrical attractions and repulsions.		
		9-12.P.3.3.e Describe how magnetism originates from motion of charged particles.		
5 Students will identify and evaluate the relationships and ethical implications of science upon technology, environment, and society.	5.1 Analyze various implications/effects of scientific advancement within the environment and society.	9-12.S.1.1 Students are able to explain ethical roles and responsibilities of scientists and scientific research.		
		9-12.S.1.2 Students are able to evaluate and describe the impact of scientific discoveries on historical events and social, economic, and ethical issues.		
	5.2 Analyze the relationships/interactions among science, technology, environment, and society.	9-12.S.2.1 Students are able to describe immediate and long-term consequences of potential solutions for technological issues.		
		9-12.S.2.1.a Describe how the pertinent technological system operates.		
		9-12.S.2.2 Students are able to analyze factors that could limit technological design.		
		9-12.S.2.3 Students are able to analyze and describe the benefits, limitations, cost, and consequences involved in using, conserving, or recycling resources.		