



Alignment Document  
State of Minnesota  
And  
Aventa Learning Physical Science

## Minnesota K-12 Academic Standards in Science Curriculum and Assessment Alignment Form

9-12	I. HISTORY AND NATURE OF SCIENCE	A. Scientific World View	<p>The student will understand the nature of scientific ways of thinking and that scientific knowledge changes and accumulates over time.</p>	<ol style="list-style-type: none"> <li>1. The student will be able to distinguish among hypothesis, theory and law as scientific terms and how they are used to answer a specific question.</li> <li>2. The student will be able to explain how scientific and technological innovations as well as new evidence can challenge portions of or entire accepted theories and models including but not limited to cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease and big bang theory.</li> <li>3. The student will recognize that in order to be valid, scientific knowledge must meet certain criteria including that it: be consistent with experimental, observational and inferential evidence about nature; follow rules of logic and reporting both methods and procedures; and, be falsifiable and open to criticism.</li> <li>4. The student will explain how traditions of ethics, peer review, conflict and general consensus influences the conduct of science.</li> <li>5. The student will recognize that some scientific ideas are incomplete, and opportunity exists in these areas for new advances.</li> </ol>	<p>Students learn about this standard throughout the course using many different examples of experiments. Students read some experiments, perform some experiments, and analyze data and explain results in lab reports. Students are introduced to the scientific terms related to this standard in the reading.</p>	<p>Students answer multiple choice questions distinguishing among the terms in the Doing Science Unit Exam. Lab activities give students the opportunity to make observations, collect data, classify, organize and compare data. The lab reports allow students to organize and display the data in tables and require explanations of methods and procedures as well as possibilities for error and improvements in the experimental set up. A discussion assignment also assesses this standard.</p>
------	----------------------------------	--------------------------	---	--	---	---

9-12	I. HISTORY AND NATURE OF SCIENCE	B. Scientific Inquiry	The student will design and conduct a scientific investigation.	<ol style="list-style-type: none"> <li>1. The student will design and complete a scientific experiment using scientific methods by determining a testable question, making a hypothesis, designing a scientific investigation with appropriate controls, analyzing data, making conclusions based on evidence and comparing conclusions to the original hypothesis and prior knowledge.</li> <li>2. The student will distinguish between qualitative and quantitative data.</li> <li>3. The student will apply mathematics and models to analyze data and support conclusions.</li> <li>4. The student will identify possible sources of error and their effects on results.</li> <li>5. The student will know that professional scientists and engineers have ethical codes.</li> <li>6. The student will give examples of how different domains of science use different bodies of scientific knowledge and employ different methods to investigate questions.</li> </ol>	Students perform nine different lab experiments which have guidelines, but do allow for some personal interpretation.	This standard is assessed with several lab reports which require students to analyze data, make conclusions based on the results and compare the conclusions to the original hypothesis. This standard is also assessed through multiple choice questions and short answer exam questions in the Doing Science Unit Exam.
------	----------------------------------	-----------------------	---	---	---	---

9– 12	I. HISTORY AND NATURE OF SCIENCE	C. Scientific Enterprise	The student will understand the relationship between science and technology and how both are used.	<ol style="list-style-type: none"> <li>1. The student will compare and contrast the purposes and career opportunities of engineering, technology and science.</li> <li>2. The student will provide an example of a need or problem identified by science and solved by engineering or technology.</li> <li>3. The student will provide an example of how technology facilitates new discoveries and the development of scientific knowledge.</li> <li>4. The student will know that technological changes and scientific advances are often accompanied by social, political, environmental and economic changes.</li> <li>5. The student will recognize that science and technology are influenced by cultural backgrounds and beliefs and by social needs, attitudes, values and limitations.</li> </ol>		
9–12	I. HISTORY AND NATURE OF SCIENCE	D. Historic Perspectives	The student will recognize the historical and cultural context of scientific endeavors and how they influence each other.	<ol style="list-style-type: none"> <li>1. The student will be able to trace the development of a scientific advancement, invention or theory and its impact on society.</li> <li>2. The student will provide examples of scientific advancements contributed by other civilizations and cultures.</li> <li>3. The student will compare and contrast the differences between scientific theories and theories from other bodies of knowledge, and the importance of each in a science discussion.</li> </ol>	Students will learn about this standard throughout the course as current topics are addressed and related to scientific concepts.	Students will participate in several discussions including the risk rewards of nuclear medicine and how the synthesis of ammonia has influenced crop production and the risks/rewards of this type of advancement.

9-12	II. PHYSICAL SCIENCE	A. Structure of Matter	The student will understand the nature of matter including its forms, properties and interactions.	<ol style="list-style-type: none"> <li>1. The student will identify protons, neutrons and electrons as the major components of the atom, their mass relative to one another, their arrangement and their charge.</li> <li>2. The student will be able to explain the relationship of an element's position on the periodic table to its atomic number and atomic mass.</li> <li>3. The student will compare and contrast the properties of an element and its isotopes, and describe how isotopes can be used in research, medicine and industry.</li> <li>4. The student will use the periodic table to identify regions, families, groups and periods.</li> <li>5. The student will explain how neutral atoms become ions.</li> <li>6. The student will be able to explain how atoms form compounds through bonding.</li> <li>7. The student will compare and contrast the states of matter in terms of interactions between particles.</li> <li>8. The student will differentiate between an atom and a molecule.</li> <li>9. The student will differentiate between an element and compound.</li> </ol>	<p>Students learn about the atom and its parts in a unit about Atomic Structure and the Periodic Table. They learn through reading, viewing graphic organizers, and doing activities such as the drag and drop matching and mouse rollovers. Examples of calculations describe how to find atomic mass. Students learn about ionic, covalent and metallic bonds in the Chemical Bonding Unit. Students read about the formation of molecules through covalently bonded atoms. Charts compare the properties of the bond types.</p>	<p>These benchmarks are assessed with multiple choice, fill in the blank, matching and short answer questions on quizzes and a unit exam. Other assessments include an isotope chart assignment where students display data about isotopes within a chart, the nuclear medicine discussion asking students to form an opinion about the use of nuclear medicine and its risk/rewards, and the periodic table exercise which has students identify different regions and information on the periodic table.</p>
------	----------------------------	---------------------------	--	---	--	--

9-12	II. PHYSICAL SCIENCE	B. Chemical Reactions	The student will describe chemical reactions and the factors that influence them.	<ol style="list-style-type: none"> <li>1. The student will describe chemical reactions using words and symbolic equations.</li> <li>2. The student will explain the influence of temperature, surface area, agitation and catalysts on the rate of a reaction.</li> <li>3. The student will distinguish between a chemical reaction and a nuclear reaction.</li> <li>4. The student will explain how the rearrangement of atoms and molecules in a chemical reaction illustrates conservation of mass.</li> <li>5. The student will describe how combining acids and bases produce a neutral solution.</li> </ol>	Students learn about equations and what the symbols stand for in the text, using a table, and with a graphic organizer. The text also shows in a table and describes the factors which affect reaction rate. The Law of Conservation of mass is shown in examples and discussed in the text.	Assessments for these benchmarks include selective response questions in quizzes and the Unit Exam, short answer questions in quizzes and the Unit Exam.
------	----------------------------	--------------------------	---	---	--	--

9-12	II. PHYSICAL SCIENCE	C. Energy Transformations	The student will understand energy forms, transformations and transfers.	<ol style="list-style-type: none"> <li>1. The student will know that potential energy is stored energy and is associated with gravitational or electrical force, mechanical position or chemical composition.</li> <li>2. The student will differentiate between kinetic and potential energy and identify situations where kinetic energy is converted into potential energy and vice versa.</li> <li>3. The student will differentiate between AC and DC current.</li> <li>4. The student will describe the production, storage and transmission of electricity.</li> <li>5. The student will be able to describe physical and chemical changes in terms of the law of conservation of energy.</li> <li>6. The student will compare and contrast the amount of energy released through chemical reactions and nuclear fission and fusion.</li> <li>7. The student will describe the risks and benefits of fossil fuels, renewable sources and nuclear power as sources of usable energy.</li> <li>8. The student will describe applications of the different wavelengths of the electromagnetic spectrum.</li> <li>9. The student will describe energy, work and power both conceptually and quantitatively.</li> </ol>	<p>Students will read and watch presentations about potential and kinetic energy and their conversions. Self Checks help students to assess their understanding as they work through the unit.</p> <p>Students will learn about applications of the different wavelengths of the electromagnetic spectrum through the readings and with graphics of the electromagnetic spectrum. Students will learn about energy, work and power through readings and sample problems.</p>	<p>Students are assessed with multiple choice quizzes and exam questions about potential and kinetic energy. Homework assignments give practice calculating potential energy, kinetic energy and work. A short answer quiz has students hypothesize about the source of a wave whose wavelength is calculated from given information as well as answer other questions about it.</p>
------	----------------------------	------------------------------	--	---	--	--

9-12	II. PHYSICAL SCIENCE	D. Motion	The student will understand the nature of force and motion.	<ol style="list-style-type: none"> <li>1. The student will use Newton's three laws of motion to qualitatively and quantitatively describe the interaction of objects.</li> <li>2. The student will describe the effect of friction and gravity on the motion of an object.</li> </ol>	Students will learn about Newton's three laws of motion through readings, audio presentations, and example calculations. Self Checks give students the opportunity to gauge their understanding.	This standard assesses students with multiple choice quiz and Unit Exam questions. There are also two essays related to this standard as well as discussion questions to post on the discussion board. The Unit Exam also contains short answer calculations and short essay explanation questions.
9-12	II. PHYSICAL SCIENCE	E. Forces of Nature	The student will understand the forces of nature and their application.	<ol style="list-style-type: none"> <li>1. The student will recognize the factors that affect the presence and magnitude of gravitational, electromagnetic, weak and strong nuclear forces.</li> <li>2. The student will identify the dominant force or forces in a variety of interactions.</li> </ol>	Students will read about gravitational and electromagnetic forces as well as see example calculations.	Assessments include multiple choice questions about gravitational and electromagnetic forces in quizzes and a Unit Exam. An essay and discussion questions will also assess students' understanding of this standard.