

## Chemistry

Standards	Benchmarks	Unit Name	Course Topic Description
<p><b>1</b> Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate results and reasonable conclusions of scientific investigations.</p>	<p><b>1.1</b> generate a question, identify dependent and independent variables, formulate testable, multiple hypotheses, plan an investigation, predict its outcome, safely conduct the scientific investigations, and collect and analyze data</p>		
	<p><b>1.2</b> select and use appropriate tools including technology to make measurements (in metric units), gather, process and analyze data from scientific investigations using appropriate mathematical analysis, error analysis, and graphical representation</p>	Covered in labs throughout the course	
	<p><b>1.3</b> review evidence, communicate and defend results, and recognize that the results of a scientific investigation are always open to revision by further investigations. (e.g. through graphical representation or charts)</p>	The Scientific Method	Scientific Method
	<p><b>1.4</b> analyze observations and explain with scientific understanding to develop a plausible model (e.g., atom, expanding universe)</p>		
	<p><b>1.5</b> identify strengths, weaknesses, and assess the validity of the experimental design of an investigation through analysis and evaluation</p>		
	<p><b>1.6</b> explain how observations of nature form an essential base of knowledge among the Montana American Indians</p>		
<p><b>2</b> Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.</p>	<p><b>2.1</b> describe the structure of atoms, including knowledge of</p>	Atoms Periodic Table	Atom
	<p><b>2.1.a</b> subatomic particles and their relative masses, charges, and locations within the atom,</p>	Atoms Periodic Table	Atom Atomic Number, Mass Number and Isotopes
	<p><b>2.1.b</b> the electrical and nuclear forces that hold the atom together,</p>	Nuclear Chemistry	Nuclear Chemistry

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	<b>2.1.c</b> fission and fusion, and	Nuclear Chemistry	Fission and Fusion
	<b>2.1.d</b> radioactive decay	Nuclear Chemistry	Fission and Fusion
	<b>2.2</b> explain how the particulate-level structure and properties of matter affect its macroscopic properties, including the effect of		
	<b>2.2.a</b> valence electrons on the chemical properties of elements and the resulting periodic trends in these properties,	Atoms/Periodic Table	Trends in the Periodic Table
		Ionic Compounds	Ionic and Covalent Compounds
	<b>2.2.b</b> chemical bonding,	Ionic Compounds	Ionic and Covalent Compounds
	<b>2.2.c</b> molecular geometry and intermolecular forces,		
	<b>2.2.d</b> kinetic molecular theory on phases of matter, and	Solids, Liquids, and Gases	Properties of Gases
	<b>2.2.e</b> carbon-carbon atom bonding on biomolecules		
	<b>2.3</b> describe the major features associated with chemical reactions, including	Chemical Reactions	Types of Chemical Reactions
	<b>2.3.a</b> giving examples of reactions important to industry and living organisms,		
	<b>2.3.b</b> energy changes associated with chemical changes,	Chemistry Fundamentals	Physical Change
		Thermodynamics	Thermodynamics
	<b>2.3.c</b> classes of chemical reactions,	Chemical Reactions	Types of Chemical Reactions
	<b>2.3.d</b> rates of reactions, and	Reaction Rates	Kinetics
	<b>2.3.e</b> the role of catalysts	Reaction Rates	Kinetics
	<b>2.4</b> identify, measure, calculate, and analyze relationships associated with matter and energy transfer or transformations, and the associated conservation of mass	Chemical Reactions	What is a Chemical Reaction?
		Scientific Method	Specific Heat Lab
		Chemical Reactions	Stoichiometry Lab
	<b>2.5</b> explain the interactions between motions and forces, including		

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	<b>2.5.a</b> the laws of motion and		
	<b>2.5.b</b> an understanding of the gravitational and electromagnetic forces		
	<b>2.6</b> explain how energy is stored, transferred, and transformed, including		
	<b>2.6.a</b> the conservation of energy,	Thermodynamics	Conservation of Energy-Calorimetry
	<b>2.6.b</b> kinetic and potential energy and energy contained by a field,		
	<b>2.6.c</b> heat energy and atomic and molecular motion, and	Thermodynamics	Thermodynamics Conservation of Energy-Calorimetry
	<b>2.6.d</b> energy tends to change from concentrated to diffuse	Thermodynamics	Conservation of Energy-Calorimetry
	<b>2.7</b> describe how energy and matter interact, including		
	<b>2.7.a</b> waves,		
	<b>2.7.b</b> the electromagnetic spectrum,		
	<b>2.7.c</b> quantization of energy, and	Atoms/Periodic Table	Quantum Theory
<b>2.7.d</b> insulators and conductors			
<b>5</b> Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.	<b>5.1</b> predict how key factors (e.g., technology, competitiveness, and world events) affect the development and acceptance of scientific thought		
	<b>5.2</b> give examples of scientific innovation challenging commonly held perceptions		
	<b>5.3</b> evaluate the ongoing, collaborative scientific process by gathering and critiquing information		
	<b>5.4</b> analyze benefits, limitations, costs, consequences, and ethics involved in using scientific and technological innovations (e.g., biotechnology, environmental issues)		
	<b>5.5</b> explain how the knowledge of science and		



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	technology applies to contemporary Montana American Indian communities (e.g., natural resources development, management and conservation)		
6 Students understand historical developments in science and technology.	6.1 analyze and illustrate the historical impact of scientific and technological advances, including Montana American Indian examples		
	6.2 trace developments that demonstrate scientific knowledge is subject to change as new evidence becomes available	Atoms/Periodic Table	Atom
	6.3 describe, explain, and analyze science as a human endeavor and an ongoing process		