

**Science**  
**Chemistry: Honors**  
**Unit 1: Atomic Structure**

<b>Essential Understandings</b>	<ul style="list-style-type: none"> <li>▪ The structure of atoms forms the basis for physical and chemical changes.</li> </ul>
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>▪ How are physical changes distinguished from chemical changes?</li> <li>▪ How does one represent chemical changes in writing?</li> <li>▪ What units are used to make measurements in chemistry?</li> <li>▪ What techniques are used to solve quantitative problems in chemistry?</li> <li>▪ How does atomic structure allow us to predict chemical behavior?</li> </ul>
<b>Essential Knowledge</b>	<ul style="list-style-type: none"> <li>▪ Chemists must properly utilize the scientific method.</li> <li>▪ A working knowledge of the metric and SI system of units is needed to solve problems.</li> <li>▪ One must master the ability to manipulate data in order to successfully solve chemistry word problems.</li> <li>▪ Atomic structure can be used to predict chemical reactivity.</li> </ul>
<b>Vocabulary</b>	<ul style="list-style-type: none"> <li>▪ <u>Terms:</u> <ul style="list-style-type: none"> <li>○ analytical chemistry, biochemistry, chemical properties, chemical reaction, chemical symbol, chemistry, compound, data, distillation, element, energy, experiment, gas, heat, heterogeneous mixture, homogeneous mixture, hypothesis, inorganic chemistry, kinetic energy, law of conservation of energy, law of conservation of mass, liquid, mass, matter, mixture, observation, organic chemistry, phase, physical change, physical chemistry, physical properties, potential energy, product, reactant, scientific law, scientific methods, solid, solution, substance, theory, vapor, absolute zero, accuracy, calorie, Celsius temperature scale, density, gram, heat capacity, heat transfer, hydrometer, International System of Units, joule, Kelvin temperature scale, kilogram, liter, meter, metric system, precision, qualitative measurement, quantitative measurement, significant figures, specific gravity, specific heat, temperature, volume, weight, conversion factors, dimensional analysis, atom, atomic mass, atomic mass unit, atomic number, cathode ray, Dalton's atomic theory, electron, isotope, mass number, neutron, nucleus, proton</li> </ul> </li> </ul>
<b>Essential Skills</b>	<ul style="list-style-type: none"> <li>▪ Transfer an academic and theoretical understanding of atomic structure to recognizing chemical and physical changes.</li> <li>▪ Calculate, using scientific measurements and dimensional analysis techniques, answers to multi-step problems.</li> </ul>

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<p><b>Related Maine Learning Results</b></p>	<p><u>Science and Technology</u> A. Unifying Themes A2.Models Students evaluate the effectiveness of a model by comparing its predications to actual observations from the physical setting, the living environment, and the technological world. C4.History and nature of Science Students describe the human dimensions and traditions of science, the nature of scientific knowledge, and historical episodes in science that impacted science and society. a. Describe and provide examples of the ethical traditions in science including peer review, truthful reporting, and making results public. b. Select and describe one of the major episodes in the history of science including how the scientific knowledge changed over time and any important effects on science and society. c. Give examples that show how societal, cultural, and personal beliefs and ways of viewing the worlds can bias scientists. d. Provide examples of criteria that distinguish scientific explanations from pseudoscientific ones.</p>
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<p><b>Related Maine Learning Results</b></p>	<p>D. The Physical Setting  D3.Matter and Energy  Students describe the structure, behavior, and interactions of matter at the atomic level and the relationships between matter and energy.</p> <ol style="list-style-type: none"> <li>a. Describe the structure of atoms in terms of neutrons, protons, and electrons and the role of the atomic structure in determining chemical properties.</li> <li>b. Describe how the number and arrangement of atoms in a molecule determine a molecule’s properties, including the types of bonds it makes with other molecules and its mass, and apply this to predictions about chemical reactions.</li> <li>c. Explain the essential roles of carbon and water in life processes.</li> <li>d. Describe how light is emitted and absorbed by atoms’ changing energy levels, and how the results can be used to identify a substance.</li> <li>e. Describe factors that affect the rate of chemical reactions (including concentration, pressure, temperature, and the presence of molecules that encourage interaction with other molecules.</li> <li>f. Apply an understanding of the factors that affect the rate of chemical reaction to predictions about the rate of chemical reactions.</li> <li>g. Describe nuclear reactions, including fusion and fission, and the energy they release.</li> <li>h. Describe the radioactive decay and half-life.</li> <li>i. Explain the relationship between kinetic and potential energy and apply the knowledge to solve problems.</li> <li>j. Describe how in energy transformations the total amount of energy remains the same, but because of inefficiencies (heat, sound, and vibration) useful energy is often lost through radiation or conduction.</li> <li>k. Apply an understanding of energy transformations to solve problems.</li> <li>l. Describe the relationship among heat, temperature, and pressure in terms of the actions of atoms, molecules, and ions.</li> </ol>
<p><b>Sample Lessons And Activities</b></p>	<ul style="list-style-type: none"> <li>▪ Laboratory Exercise: Physical and Chemical Changes</li> <li>▪ Laboratory Exercise: Specific Heat</li> <li>▪ Laboratory Exercise: “How Many Turtles?” (dimensional analysis)</li> </ul>

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<b>Sample Classroom Assessment Methods</b>	<ul style="list-style-type: none"> <li>▪ Quizzes</li> <li>▪ Laboratory reports</li> <li>▪ Exams</li> </ul>
<b>Sample Resources</b>	<ul style="list-style-type: none"> <li>▪ <u>Publications:</u> <ul style="list-style-type: none"> <li>○ <u>Chemistry</u> - Wilbraham, Staley, Simpson, and Matta</li> <li>○ <u>Chemistry Survival Skills</u> - Brault and MacDevitt</li> <li>○ <u>ChemMatters</u>, a periodical for students, - American Chemical Society</li> <li>○ Selected tutorial programs in the Learning Lab</li> </ul> </li> <li>▪ <u>Videos:</u> <ul style="list-style-type: none"> <li>○ Program selections from The World of Chemistry series</li> <li>○ Program selections from the Chem Study series</li> </ul> </li> </ul>