Chemistry You Need to Know and Maine Science Standards

	Maine	Chpt 1--Scientists Tools	Chpt 2--Antacids	Chpt 3--Airbags	Chpt 4--Light	Chpt 5--Soap	Chpt 6--Sports Drinks	Chpt 7--Hot packs	Chpt 8--Industry	Chpt 9--Forensics	Chpt 10--Batteries	Chpt 11--Polymers	Chpt 12--Nuclear radiation
A1 Systems	a. Analyze a system using the principles of boundaries, subsystems, inputs, outputs, feedback, or the system's relation to other *systems* and design solutions to a *system* problem.							Chapter 7					
	Explain and provide examples that illustrate how it may not always be possible to predict the impact of changing some part of a man-made or natural *system* .								Section 8-5				
A4 Scale	a. Describe how large changes of scale may change how physical and biological *systems* work and provide examples.								Section 8-5				
	Mathematically represent large magnitudes of scale.	Section 1-6											
	a. Identify questions, concepts, and testable hypotheses that guide scientific investigations.	Introduced in Section 1-3 and used in inquiry labs in each chapter throughout											
	b. Design and safely conduct methodical scientific investigations, including experiments with controls.	Introduced in Section 1-1 and used in inquiry labs in each chapter throughout											
	c. Use statistics to summarize, describe, analyze, and interpret results.	Introduced in Section 1-1 and used in inquiry labs in each chapter throughout											

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B1. Skills and traits of inquiry	d. Formulate and revise scientific investigations and *models* using logic and evidence.	Introduced in Section 1-1 and used in inquiry labs in each chapter throughout											
	e. Use a variety of tools and technologies to improve investigations and communications.	Introduced in Section 1-1 and used in inquiry labs in each chapter throughout											
	f. Recognize and analyze alternative explanations and *models* using scientific criteria.	Introduced in Section 1-1 and used in inquiry labs in each chapter throughout											
	Communicate and defend scientific ideas.	Introduced in Section 1-1 and used in inquiry labs in each chapter throughout											
B2. Skills and traits of Technology design	a. Identify new problems or a current design in need of improvement.	Used in chapter themes and final project as well as inquiry labs in each chapter											
	b. Generate alternative design solutions.	Used in chapter themes and final project as well as inquiry labs in each chapter											
	c. Select the design that best meets established criteria.	Used in chapter themes and final project as well as inquiry labs in each chapter											
	d. Use *models* and simulations as prototypes in the design planning process.	Used in chapter themes and final project as well as inquiry labs in each chapter											
	e. Implement the proposed design solution.	Used in chapter themes and final project as well as inquiry labs in each chapter											
	f. Evaluate the solution to a design problem and the consequences of that solution.	Used in chapter themes and final project as well as inquiry labs in each chapter											

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	Present the problem, design process, and solution to a design problem including models, diagrams, and demonstrations	Used in chapter themes and final project as well as inquiry labs in each chapter											
C1. Understandings of Inquiry	a. Describe how hypotheses and past and present knowledge guide and influence scientific investigations.	Introduced in Section 1-1 and used in inquiry labs in each chapter throughout											
	Describe how scientists defend their evidence and explanations using logical arguments and verifiable results.	Introduced in Section 1-1 and used in inquiry labs in each chapter throughout											
C2. Understandings of technology	a. Provide an example that shows how science advances with the introduction of new technologies and how solving technological problems often impacts new scientific knowledge.	Used in chapter themes and final project as well as inquiry labs in each chapter											
	b. Provide examples of how creativity, imagination, and a good knowledge base are required to advance scientific ideas and *technological design* .	Used in chapter themes and final project as well as inquiry labs in each chapter											
	Provide examples that illustrate how technological solutions to problems sometimes lead to new problems or new fields of inquiry.	Used in chapter themes and final project as well as inquiry labs in each chapter											

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C3. Science, technology & society	a. Explain how science and technology influence the *carrying capacity* and sustainability of the planet.												
	b. Explain how ethical, societal, political, economic, and cultural factors influence personal health, safety, and the quality of the environment.								Section 8-5				Section 12-1
	c. Explain how ethical, societal, political, economic, religious, and cultural factors influence the development and use of science and technology.	Used in chapter themes and final project as well as inquiry labs in each chapter											
C4.	a. Describe and provide examples of the ethical traditions in science including peer review, truthful reporting, and making results public.	Introduced in Section 1-1 and used in inquiry labs in each chapter throughout											
	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.				Section 4-1								

History & Nature of Science	Maine	Chpt 1--Scientists Tools	Chpt 2--Antacids	Chpt 3--Airbags	Chpt 4--Light	Chpt 5--Soap	Chpt 6--Sports Drinks	Chpt 7--Hot packs	Chpt 8--Industry	Chpt 9--Forensics	Chpt 10--Batteries	Chpt 11--Polymers	Chpt 12--Nuclear radiation
	c. Give examples that show how societal, cultural, and personal beliefs and ways of viewing the world can bias scientists.	Used in chapter themes and final project as well as inquiry labs in each chapter											
	d. Provide examples of criteria that distinguish scientific explanations from pseudoscientific ones.	Introduced in Section 1-1 and used in inquiry labs in each chapter throughout											
	a. Describe the structure of atoms in terms of neutrons, protons, and electrons and the role of the atomic structure in determining chemical properties.				Section 4-1, 4-2, 4-3	Section 5-, 5-2							
	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.					Section 5-3, 5-4, 5-6, 5-7							
	c. Explain the essential roles of carbon and water in life processes.					Section 5-6						Section 11-1	
	d. Describe how light is emitted and absorbed by atoms' changing energy levels, and how the results can be used to identify a substance.				Section 4-6, 4-7								

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D3. Matter and Energy	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).		Section 2-8										
	f. Apply an understanding of the factors that affect the rate of chemical reaction to predictions about the rate of chemical reactions.		Section 2-8										
	g. Describe nuclear reactions, including fusion and fission, and the energy they release.												Section 12-1
	h. Describe radioactive decay and half-life.												Section 12-1
	i. Explain the relationship between kinetic and potential energy and apply the knowledge to solve problems.												
	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.							Section 7-2					

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k. Apply an understanding of energy transformations to solve problems.							Section 7-2, 7-3, 7-4					
Describe the relationship among *heat* , *temperature* , and pressure in terms of the actions of atoms, molecules, and ions.				Section 3-1, 3-5, 3-7		Section 6-1, 6-7	Section 7-1					