



LAB-AIDS CORRELATIONS to TENNESSEE

HIGH SCHOOL CHEMISTRY¹

*A Natural Approach to Chemistry (NAC)*² is written by Hsu, Chaniotakis, Carlisle, and Damelin. This correlation is intended to show selected locations in NAC programs that support the standards for high school chemistry.

This document was prepared by Oralia Gil, LAB-AIDS Curriculum Specialist, and Mark Koker, Ph D, Director of Curriculum. This is not an exhaustive document. It is designed to provide a general overview of the alignment of *A Natural Approach to Chemistry* to the state science program standards, grades 9-12, for review and adoption purposes. Support for the state standards may be found at other locations besides those explicitly stated in this document.

For more information about this correlation or for questions about review copies, presentations, or any matters related to sales or service, please contact John Garrett, LAB-AIDS Regional Sales Manager, at 704.841.0962, or by email at jgarrett@lab-aids.com, or visit us on the web at www.lab-aids.com.

¹ <http://www.tn.gov/education/ci/sci/index.shtml>

² http://www.anaturalapproachtochemistry.com/nac_home.php



The Natural Approach to Chemistry		
THEMES		
Energy is a unifying theme that explains why chemistry occurs		
The atomic model of matter is consistently woven through every chapter		
Understanding of 'why' chemistry occurs is emphasized		
Principles are illustrated with examples from the human body and the environment		
ORGANIZATION OF CONTENT		
Fundamentals	Chapters 1 -4	Present comprehensive overview of all main ideas in chemistry such as the atomic nature of matter, systems, temperature, and energy. <i>"Big Picture"</i>
Core Concepts	Chapters 5 - 14	Present in-depth coverage of all major topic areas. They developed usable understanding of the big ideas laid out in the first four chapters. The treatment includes strong conceptual development as well as algebra-based quantitative problem solving. <i>All academic content and instruction standards for chemistry have been met by the end of Chapter 14.</i>
Applications	Chapter 15 - 21	Provide deeper exploration of significant areas of interest in chemistry. <i>Examples include rechargeable batteries, materials science, planetary atmospheres, etc.</i>
COMPLETE LEARNING SYSTEM		
Coordinated student textbook		
Integrated laboratory investigations manual containing 58 labs to choose from		
New laboratory control, data collection and probe system		
Evaluation elements throughout the curriculum (student book and lab investigation manual) through which student knowledge or skills are assessed or applied		

Correlation Citation Reference Key:

Locations are given in the student book (SB) and/or laboratory manual (LM).

1.2 pp. 19-25

Means Student Book Chapter 1 Section 1.2 pages 19 – 25

1A, 3 A-C, 11A

Means Lab Investigations Manual Chapter 1 Investigation 1A;

Chapter 3 Investigation 3A, 3B and 3C;

Chapter 11 Investigation 11A

Relevant questions from the student book (SB) and lab manual (LM) problem sets and questions are indicated, e.g.,

1.2 18-30, 51-55

Means Student Book Chapter 1 Section 1.2 questions 18-30 and questions 51-55

3B (PART 4, 5, 8)

Means Laboratory Investigations Manual Chapter 3 Investigation 9A Part 4 Investigation 9B Part 5 and Part 8.

Embedded Standards Course Level Expectations	NAC Location		
	Student Book Location	Lab Manual Location	Where assessed
Embedded Inquiry			
Conceptual Strand			
<i>Understandings about scientific inquiry and the ability to conduct inquiry are essential for living in the 21st century.</i>			
CLE 3221.Inq.1 Recognize that science is a progressive endeavor that reevaluates and extends what is already accepted.	1.2, p.19-26	2C, 3C, 4A, 5B, 9A, 9B, 13A, 14B	1.2, 51-55, p.34 2A (Part 5); 2B (Part 4); 3A (Part 4, 5, 8); 3B (Part 3, 5, 6); 11A (Part 2, 4);
CLE 3221.Inq.2 Design and conduct scientific investigations to explore new phenomena, verify previous results, test how well a theory predicts, and compare opposing theories.	1.2, p.19-26	Throughout, e.g., 1C, 2A, 2C, 3A-D, 4A, 5B, 8A, 9A-C, 10B-C, 11A, 12A, 13A, 15AD, 17B...	1.2, 51-55, p.34 3A (Part 4, 5, 8); 3B (Part 3, 5, 6); 9A (Part 4); 9B (Part 6); 9C (Part 4, 5)
CLE 3221.Inq.3 Use appropriate tools and technology to collect precise and accurate data.	1.2, p.19-26	2C, 3C, 4A, 5B, 9A, 9B, 13A, 14B	1.2, 51-55, p.34 2A (Part 5); 2B (Part 4); 3A (Part 4, 5, 8); 3B (Part 3, 5, 6); 11A (Part 2, 4);
CLE 3221.Inq.4 Apply qualitative and quantitative measures to analyze data and draw conclusions that are free of bias.		3B; 8A; 9B; 11B; 12B; 13B; 14A...	3B (Part 6); 8A (Part 3); 9B (Part 6); 11B (Part 6)
CLE 3221.Inq.5 Compare experimental evidence and conclusions with those drawn by others.	1.3, pp.30-31; 3.3, pp.96-97; pp.318-321; pp.562-563		3.3, 48-57, p.100
CLE 3221.Inq.6 Communicate and defend scientific findings.	Throughout chapters 18, 19, 20, 21		18.3, 80-99, p.603; 19.3, 54-80, p.632
Embedded Technology & Engineering			
Conceptual Strand			

Embedded Standards Course Level Expectations	NAC Location		
	Student Book Location	Lab Manual Location	Where assessed
<i>Society benefits when engineers apply scientific discoveries to design materials and processes that develop into enabling technologies.</i>			
CLE 3221.T/E.1 Explore the impact of technology on social, political, and economic systems.	Throughout to be found in Chemistry Connections at end of chapters		
CLE 3221.T/E.2 Differentiate among elements of the engineering design cycle: design constraints, model building, testing, evaluating, modifying, and retesting.			
CLE 3221.T/E.3 Explain the relationship between the properties of a material and the use of the material in the application of a technology.	Throughout, e.g., 1C, 2A, 2C, 3A-D, 4A, 5B, 8A, 9A-C, 10B-C, 11A, 12A, 13A, 15AD, 17B...	2A (Part 5); 2C (Part 2, 5); 3A (Part 4, 5, 8); 3B (Part 3, 5, 6); 4A (Part 3, 4); 10B (Part 3, 5, 7); 10C (Part 3, 4)	
CLE 3221.T/E.4 Describe the dynamic interplay among science, technology, and engineering within living, earth-space, and physical systems.	Ch. 18, Ch. 19, Ch. 20, Ch. 21		
Embedded Mathematics			
Conceptual Strand			
<i>Science applies mathematics to investigate questions, solve problems, and communicate findings.</i>			
CLE 3221.Math.1 Understand the mathematical principles associated with the science of chemistry.		1D, 3A, B, D; 8A, 9A, 11A-B, 13D, Appendix C, pp. 168-172	3A (Part 4, 5, 8); 3B (Part 3, 5, 6); 9A (Part 4); 11A (Part 2, 4, 8); 11B (Part 4-6)
CLE 3221.Math.2 Utilize appropriate mathematical equations and processes to solve chemistry problems.	Throughout, e.g., 1.1, pp15-18; 3.2, pp.79-86; 5.4, p. 157; 9.2, p.		3.2, 39-47, p.99; 5.4, 52-63, p.164; 9.2, 76-80, p.293; 11.1, 38-45, p.362

Embedded Standards Course Level Expectations	NAC Location		
	Student Book Location	Lab Manual Location	Where assessed
	270-272; 9.2, p. 277; 11.1, pp.332-338; 11.2, pp. 342-344, 13.2, pp. 418-420...		

Course Level Expectations	NAC Location		
	Student Book Location	Lab Manual Location	Where assessed
Standard 1: Atomic Structure			
Conceptual Strand 1 <i>Atomic theory is the foundation for understanding the interactions and changes in matter.</i>			
CLE 3221.1.1 Compare and contrast historical models of the atom.	5.1 pp.135-136; 5.2 pp.144-151	5A	5.1, 23-28, 64-67, pp. 163-165
CLE 3221.1.2 Analyze the organization of the modern periodic table.	6.1 pp.168-176; 6.2 pp.177-183	6A, B	6.1,12-20, 40-49, 6.2, 21-29, 45-49, pp.192-195
CLE 3221.1.3 Describe an atom in terms of its composition and electron characteristics.	5.3 pp.152-154; 6.3 pp.184-189; 7.2 pp.207-213	6C; 7A	5.3, 41-51, 71-76, pp.163-165 6.3, 30-39, 50-52, pp.193-194 7A Part 2, 4
Standard 2 - Matter and Energy			
Conceptual Strand 2 <i>The properties of matter determine how it interacts with energy.</i>			
CLE 3221.2.1 Investigate the characteristic properties of matter.	2.3 pp.56-63; 9.1 pp.262-269; Ch.9 pp.262-287	2A, C 9A-C; 10A	2.3, 46-52, 68-78, pp.68-69; Ch. 9, 28-87, pp.291-293
CLE 3221.2.2 Explore the interactions between matter and energy.	Ch.3 pp.74-95; Ch.4 pp.104-125	3A-D; 4A-C	Ch. 3, 34-84, pp.99-101; Ch. 4, 36-72, pp.129-131
CLE 3221.2.3 Apply the kinetic molecular theory to describe solids, liquids, and gases.	14.1 pp.442-449; 16.2 pp.516		14.1, 7-16, p.468
CLE 3221.2.4 Investigate characteristics associated with the gaseous state.	Ch.14 pp.442-465	14A-B	Ch. 14, 7-79, pp.468-471
CLE 3221.2.5 Discuss phase diagrams of one-component systems.	3.3 p.94, 16.3 p.524		16.3, 80-88, p.535
Standard 3 – Interactions of Matter			

Course Level Expectations	NAC Location		
	Student Book Location	Lab Manual Location	Where assessed
Conceptual Strand 3			
<i>Interactions between matter generate substances with new physical and chemical properties.</i>			
CLE 3221.3.1 Investigate chemical bonding.	Ch.7 pp.198-221; Ch. 8 pp.230-253	7A-B; 8A-B	Ch. 7, 18-69, pp.224-227; Ch. 8, 20-77, pp.257-259
CLE 3221.3.2 Analyze chemical and nuclear reactions.	Ch.10 pp.296-317; Ch.20 pp.636-657	10B; 20A-B	Ch. 10, 30-71, pp.323-325; Ch. 20, 40-90, pp.661-663
CLE 3221.3.3 Explore the mathematics of chemical formulas and equations.	Ch.11 pp.328-357; Ch.13 pp.410-433	11A-B 13A-D	Ch. 11, 9-69, pp.360-365; Ch. 13, 21-81, pp.437-439
CLE 3221.3.4 Explain the law of conservation of mass/energy.	3.2 p. 81; 4.2 p.117	3C	3.2, 39-47, p.99