



## LAB-AIDS Correlations to North Carolina Essential Standards for Chemistry

A Natural Approach to Chemistry (NAC) is written by Hsu, Chaniotakis, Carlisle, and Damelin, and is published by, and available exclusively from, LAB-AIDS, Ronkonkoma NY. This correlation is intended to show selected locations in NAC programs that support North Carolina Essential Standards for Chemistry. It is not an exhaustive list; other locations may exist that are not listed here.

This document was prepared by Oralía Gil, Curriculum Specialist, at LAB-AIDS. *The Natural Approach to Chemistry* is published by, and available exclusively from, LAB-AIDS, Ronkonkoma NY, 800.381.8003.

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<b>The Natural Approach to Chemistry</b>		
<b>THEMES</b>		
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		
<b>ORGANIZATION OF CONTENT</b>		
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>
<b>COMPLETE LEARNING SYSTEM</b>		
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**

Means Student Book Chapter 1 Section 1.2 pages 19 – 25

**1A, 3D, 11A**

Means Lab Investigations Manual Chapter 1 Investigation 1A;

Chapter 3 Investigation 3D;

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

**13C Part 5**

Means Lab Investigations Manual Chapter 13 Investigation 13C, Part 5

Reference	Descriptor	Location in NAC	
		Student Book Lab Manual	Assessment
<b>Matter: Properties and Change</b>			
Chm.1.1	Analyze the structure of atoms and ions.		
Chm.1.1.1	Analyze the structure of atoms, isotopes, and ions.	5.1, 5.2 5A	5.1 (23-28), (64-67) 5.2 (29-40), (68-70) 5A Part 2, Part4
Chm. 1.1.2	Analyze an atom in terms of the location of electrons.	5.3; 6.3, 7.2 6C	5.3 (41-51), (71-76)
Chm. 1.1.3	Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model.	5.4 5C	5.4 (52-63)  5C Part 2
Chm. 1.1.4	Explain the process of radioactive decay by the use of nuclear equations and half-life.	20.2, 20.3 20A	20.2 (43-53), (70-73) 20.3 (54-56), (74-81) 20A Part 4
Chm.1.2	Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties.		
Chm. 1.2.1	Compare (qualitatively) the relative strengths of ionic, covalent, and metallic bonds.	2.1, 7.1	7.1 (18-32)
Chm. 1.2.2	Infer the type of bond and chemical formula formed between atoms.	2.1, 4.1, 7.1, 7.2; 8.1 8A	7.2 (46-55)
Chm. 1.2.3	Compare inter- and intra- particle forces.	4.1, 5.1, 8.3	8.3 (39-47), (63-64)
Chm. 1.2.4	Interpret the name and formula of compounds using IUPAC convention.	8.1, 8.2, 17.1 2B, 7A, 8B	8.1 (20-27), (52-58) 8.2 (28-38), (59-62) 8B Part 3, 4

Reference	Descriptor	Location in NAC	
		Student Book Lab Manual	Assessment
Chm. 1.2.5	Compare the properties of ionic, covalent, metallic, and network compounds.	8.2	8.2 (28-38), (59-62)
Chm. 1.3	Understand the physical and chemical properties of atoms based on their position in the Periodic Table.		
Chm. 1.3.1	Classify the components of a periodic table (period, group, metal, metalloid, nonmetal, transition).	4.1, 6.1 6A, B	6.1 (12-20), (40-44)
Chm. 1.3.2	Infer the physical properties (atomic radius, metallic and nonmetallic characteristics) of an element based on its position on the Periodic Table.	6.2 6A-C	6.2 (21-29), (45-49)
Chm. 1.3.3	Infer the atomic size, reactivity, electronegativity, and ionization energy of an element from its position in the Periodic Table.	6.1, 6.3 6C	6.1 (12-20), (40-44) 6.3 (30-39), (50-52) 6C Part 4
<b><i>Energy: Conservation and Transfer</i></b>			
Chm.2.1	Understand the relationship among pressure, temperature, volume, and phase.		
Chm. 2.1.1	Explain the energetic nature of phase changes.	3.1, 3.2, 3.3 4A	3.3 (48-57), (69-79)
Chm. 2.1.2	Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point).	3.3 3C, D	3.3 (48-57), (69-79) 3D Part 3
Chm. 2.1.3	Interpret the data presented in phase diagrams.	3.3	3.3 (48-57), (69-79)
Chm. 2.1.4	Infer simple calorimetric calculations based on the concepts of heat lost equals heat gained and specific heat.	3.2, 9.3 3B 9C 10C	3.2 (36-44), (61-68) 9.3 (57-74), (84-90) 3B Part 3, 5, 6 9C Part 4
Chm. 2.1.5	Explain the relationships between pressure, temperature, volume, and quantity of gas both qualitative and quantitative.	14.2, 14.3	14.2 (17-31), (36-75)

Reference	Descriptor	Location in NAC	
		Student Book Lab Manual	Assessment
Chm.2.2	Analyze chemical reactions in terms of quantities, product formation, and energy.		
Chm. 2.2.1	Explain the energy content of a chemical reaction.	4.2, 10.4 10C	4.2 (48-59) 10.4 (44-48)
Chm. 2.2.2	Analyze the evidence of chemical change.	4.1, 4.2, 10.1 4B, C	4.1 (36-47), (64-65) 4C Part 3, 5, 7
Chm. 2.2.3	Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion).	4.2, 4.3, 10.1, 10.2, 10.3 4B, C 10A, B	4.2 (66-72) 10.1 (31-39) 10.2 (40) 10.3 (41-43), (67-68) 10A Part 2 10B Part 5, 8
Chm. 2.2.4	Analyze the stoichiometric relationships inherent in a chemical reaction.	11.1, 11.2, 11.3, 11.4 11A, B	11.1 (38-45) 11.4 (64-69) 11A Part 4, 5, 7, 8 11B Part 5, 6
Chm. 2.2.5	Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and hydrates).	8.2, 8.4 2B, 8A	8.4 (66-78) 8A Part 2, 3
<b><i>Interactions of Matter and Energy</i></b>			
Chm. 3.1	Understand the factors affecting rate of reaction and chemical equilibrium.		
Chm. 3.1.1	Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst).	11.3, 11.4, 12.1, 12.4 12A, B	11.3 (30-37), (58-63) 11.4 (64-69) 12.1 (20-34), (59-610) 12.4 (52-58) 12A Part 6, 7 12B Part 6
Chm. 3.1.2	Explain the conditions of a system at	12.2, 12.3	12.2 (35-46),

Reference	Descriptor	Location in NAC	
		Student Book Lab Manual	Assessment
	equilibrium.		(62-63) 12.3 (47-51)
Chm. 3.1.3	Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle).	12.2 12C	12.2 (35-46), (62-63) 12C Part 3, 4
Chm.3.2	Understand solutions and the solution process.		
Chm. 3.2.1	Classify substances using the hydronium and hydroxide ion concentrations.	13.1, 13.2, 13.3 13A	13.2 (36-46), (63-67) 13.3 (68-76)
Chm. 3.2.2	Summarize the properties of acids and bases.	4.3, 13.1, 13.2, 13.3, 13.4	13.1 (22-35) 13.3 (47-53)
Chm. 3.2.3	Infer the quantitative nature of a solution (molarity, dilution, and titration with a 1:1 molar ratio).	9.3, 13.3, 13.4 13B, C, D	13.4 (54-62), (77-83) 13B Part 3, 4 13C Part 4, 5 13D Part 2, 4
Chm. 3.2.4	Summarize the properties of solutions.	9.2, 9.3 9A, B	9.2 (44-56), (75-83) 9.3 (57-74), (84-90)
Chm. 3.2.5	Interpret solubility diagrams.	9.1, 9.2 9B	9B Part 6
Chm. 3.2.6	Explain the solution process.	2.3, 9.1, 9.2 2C, 10A	2.3 (68-78) 9.1 (29-43) 10A Part 3, 4