LAB-AIDS CORRELATIONS

SOUTH CAROLINA

HIGH SCHOOL LEVEL, CHEMISTRY

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This document is intended to show how our chemistry curriculum products align with the 2014 SC Academic Standards and Performance Indicators.[1]

ABOUT OUR PROGRAMS

LAB-AIDS Core Science Programs are developed to support current knowledge on the teaching and learning of science. All materials support an inquiry-driven pedagogy, with support for literacy skill development and with assessment programs that clearly show what students know and are able to do from using the programs. All programs have extensive support for technology in the school science classrooms, and feature comprehensive teacher support. For more information please visit www.lab-aids.com and navigate to the program of interest.

A Natural Approach to Chemistry, Second Edition (©2016)

A Natural Approach to Chemistry (NAC) is a comprehensive program which includes a student textbook, a laboratory manual, a teacher's guide for both, a complete lab materials package, an integrated RGB spectrophotometer, heater, probe, and data collection system , and numerous ancillary resources (ExamView, instructional videos, PowerPoints, etc). All books are available in print, as e-books, and on-line through teacher and student portals, which also provide users access to the appropriate ancillary resources. All books are written by Hsu, Chaniotakis, et al., and are published by, and available exclusively from, LAB-AIDS, Inc., Ronkonkoma, NY (www.lab-aids.com).

A 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

[1] https://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Chemistry1_SupportDocument2_0.pdf

A Natural Approach to Chemistry		
ORGANIZATION OF STUDENT BOOK 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. *This is the "big picture" of chemistry.*
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. *All academic content and instruction standards for chemistry have been met by the end of Chapter 14.*
Applications	Chapter 15 - 21	Provide deeper exploration of significant areas of interest in chemistry. *Examples include rechargeable batteries, materials science, chemistry of the solar system, etc.*
A COMPLETE LEARNING SYSTEM		
• Coordinated student textbook and laboratory investigations manual containing 58 labs • Comprehensive Teacher's Guide with materials and suggestions for diverse learners • Integrated RGB spectrophotometer, heater, probe and data collection system • Evaluation elements throughout the coordinated program through which student knowledge and skills are assessed and applied formatively and summatively. • Suite of digital resources accessible through DVD and/or online student and teacher portals		

ABOUT THE CITATIONS IN THIS DOCUMENT

This is a representative, but not exhaustive, list of the program's alignment to SC chemistry standards, particularly for Standards 1A and 1B, and the document was produced to give the reader full confidence that our materials meet or exceed the state goals for the chemistry program. In some cases, lesson ranges are specified instead of individual lessons, particularly where meeting the Standard (e.g., cross-cutting concepts) is best achieved in a series of lessons. In some cases you will notice clarification statements of our own that specify our treatment of a particular Standard.

Citations included in the correlation document are as follows:

Student Book by chapter (+/- section and page(s)): e.g. SB 1, or SB 1.1, or SB 1.1 pp 15-18
Laboratory Investigation Manual by investigation or page(s): e.g. LIM 1A or LIM pp 51-52

SC STANDARD	WHERE TAUGHT	WHERE TESTED
CHEMISTRY 1 SCIENCE AND ENGINEERING PRACTICES		
Standard H.C.1: The student will use the science and engineering practices, including the processes and skills of scientific inquiry, to develop understandings of science content.		
H.C.1A. Conceptual Understanding: The practices of science and engineering support the development of science concepts, develop the habits of mind that are necessary for scientific thinking, and allow students to engage in science in ways that are similar to those used by scientists and engineers. *Performance Indicators: Students who demonstrate this understanding can:*		
H.C.1A.1 Ask questions to (1) generate hypotheses for scientific investigations, (2) refine models, explanations, or designs, or (3) extend the results of investigations or challenge scientific arguments or claims.	Every lab begins with essential questions, and contains "think about what you found" and other analysis questions. All units in the student book use the 5E model for lesson design. (1) LIM 1A, 2B, 2C, 5A, 5B, 6C, 7A-B (2) LIM 1B, 2B, 5A, 6C, 10A (3) LIM 3A, 10A, 13A,	
H.C.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.	(1) LIM 2B, 2C, 5A, 6C, 7A, 7B (2) LIM 2C, 3C, 3D, 5B, 13A, 15A-D, 17B (3) LIM 3C: 1; 4A: 2-3; 5B: 4; 5C: 3; 7A-C; 9A: 2; 9B; 12B: 5; 13A: 8; 14B: 3	
H.C.1A.3 Plan and conduct controlled scientific investigations to answer questions, test hypotheses, and develop explanations: (1) formulate scientific questions and testable hypotheses based on credible scientific information, (2) identify materials, procedures, and variables, (3) use appropriate laboratory equipment, technology, and techniques to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.	(1)-(2) SB 1.2, LIM 1A, 1C, 2A, 2C, 3A-D, 4A, 5B, 8A, 9A-C, 10B-C, 11A, 12A, 13A, 15A-D, 17B… (3) LIM 2C, 3C, 4A, 5A, 5B, 7A, 9B, 13A… (4) LIM 2C, 3C, 4A, 5A, 5B, 7A… Safety procedures are detailed in every lab, and safety rules and a safety quiz can be found on pp. xiii-xvi in the LIM.	
H.C.1A.4 Analyze and interpret data from informational texts and data collected from investigations using a range of methods (such as tabulation, graphing, or statistical analysis) to (1) reveal patterns and construct meaning, (2) support or refute hypotheses, explanations, claims, or designs, or (3) evaluate the strength of conclusions.	(1) – (3) See for example LIM 2C, 3C, 4A, 8A (error analysis) 9A, 9B, 13A, 14B SB 3.1, 4.2, 6.1, 9.2, 10.4, 12.1, 12.2…	
H.C.1A.5 Use mathematical and computational thinking to (1) use and manipulate appropriate metric units, (2) express relationships between variables for models and investigations, and (3) use grade-level appropriate statistics to analyze data.	(1)-(3) LIM 1D, 3A, 3B, 3D, 8A, 9A, 11A, 11B, 13D, Appendix C, pp. 168-172	

SC STANDARD	WHERE TAUGHT	WHERE TESTED
	SB, Throughout, e.g., 1.1, pp 15-18; 3.2, pp 85-86; 5.4, p. 157; 9.2, p. 270-272; 9.2, p. 277; 11.1, pp. 332-338; 11.2, pp. 342-344, 13.2, pp. 418-420…	
H.C.1A.6 Construct explanations of phenomena using (1) primary or secondary scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.	(1) (4) LIM 1B, 2B, 5A, 6C, 10A (2) LIM 3A, 3C, 4C, 5B, 9A, 9B, 10A… (3) 2C, 3C, 4A, 5B, 9A, 9B, 13A, 14B (4) LIM 2C, 3C, 4A, 5A, 5B, 7A, 9B, 13A…	
H.C.1A.7 Construct and analyze scientific arguments to support claims, explanations, or designs using evidence and valid reasoning from observations, data, or informational texts.	SB 5.1, p. 135-136; 5.2, p. 144; 13.1, pp. 412-413; 14.2, p. 454; 15.4, p. 494 LIM 3B: 6; 8A:3; 9B: 6; 11B: 6; 12B: 6; 13B: 4; 14A:3…	
H.C.1A.8 Obtain and evaluate scientific information to (1) answer questions, (2) explain or describe phenomena, (3) develop models, (4) evaluate hypotheses, explanations, claims, or designs or (5) identify and/or fill gaps in knowledge. Communicate using the conventions and expectations of scientific writing or oral presentations by (1) evaluating grade-appropriate primary or secondary scientific literature, or (2) reporting the results of student experimental investigations.	(1) - (4) SB 1.2, pp. 19-26; 1.3, pp 30-31; 10.4, pp. 318-319; 15.4, pp. 504-505; 18.4, pp. 598-599; 19.3, pp. 628-629 (1)-(3) LIM Throughout, e.g., 3C: 1; 4A: 2-3; 5B: 4; 5C: 3; 7A-C; 9A: 2; 9B; 12B: 5; 13A: 8; 14B: 3	
H.C.1B. Conceptual Understanding: Technology is any modification to the natural world created to fulfill the wants and needs of humans. The engineering design process involves a series of iterative steps used to solve a problem and often leads to the development of a new or improved technology. *Performance Indicators: Students who demonstrate this understanding can:*		
H.C.1B.1 Construct devices or design solutions using scientific knowledge to solve specific problems or needs: (1) ask questions to identify problems or needs, (2) ask questions about the criteria and constraints of the device or solutions, (3) generate and communicate ideas for possible devices or solutions, (4) build and test devices or solutions, (5) determine if the devices or solutions solved the problem and refine the design if needed, and (6) communicate the results.	LIM See for example 14B, 17A, 17B SB See for example Ch 3 pp. 96-97 (Chemistry Connections, thermodynamics), Ch 7 pp. 254-55 (nanotechnology), Ch 15 (catalytic converters), etc.	
ATOMIC STRUCTURE AND NUCLEAR PROCESSES		
Standard H.C.2: The student will demonstrate an understanding of atomic structure and nuclear processes.		
H.C.2A. Conceptual Understanding: The existence of atoms can be used to explain the structure and behavior of matter. Each atom consists of a charged nucleus, consisting of protons and neutrons, surrounded by electrons. The interactions of these electrons between and within atoms are the		

SC STANDARD	WHERE TAUGHT	WHERE TESTED
primary factors that determine the chemical properties of matter. In a neutral atom the number of protons is the same as the number of electrons. *Performance Indicators: Students who demonstrate this understanding can:*		
H.C.2A.1 Obtain and communicate information to describe and compare subatomic particles with regard to mass, location, charge, electrical attractions and repulsions, and impact on the properties of an atom.	SB 5.1, pp. 137-143 LIM 5A	SB 5.1, p. 163
H.C.2A.2 Use the Bohr and quantum mechanical models of atomic structure to exemplify how electrons are distributed in atoms.	SB 5.2, pp. 144-151 LIM 5A (first four energy levels only)	SB 5.2, pp. 163-164 LIM p. 48
H.C.2A.3 Analyze and interpret absorption and emission spectra to support explanations that electrons have discrete energy levels.	SB 5.3-5.4, pp. 152-159 LIM 5C	SB 5.4, pp. 164-165
H.C.2B. Conceptual Understanding: In nuclear fusion, lighter nuclei combine to form more stable heavier nuclei and in nuclear fission heavier nuclei are split to form lighter nuclei. The energies in fission and fusion reactions exceed the energies in usual chemical reactions. *Performance Indicators: Students who demonstrate this understanding can:*		
H.C.2B.1 Obtain and communicate information to compare alpha, beta, and gamma radiation in terms of mass, charge, penetrating power, and their practical applications (including medical benefits and associated risks).	SB 20.2, pp. 637-641 LIM 5C	SB 20.2, p. 661-662 LIM p. 51-52
H.C.2B.2 Develop models to exemplify radioactive decay and use the models to explain the concept of half life and its use in determining the age of materials (such as radiocarbon dating, the use of radioisotopes to date rocks).	SB 20.3, pp. 642-646 LIM 20A	SB 20.3, pp. 662-663 LIM p. 152
H.C.2B.3 Obtain and communicate information to compare and contrast nuclear fission and nuclear fusion and to explain why the ability to produce low energy nuclear reactions would be a scientific breakthrough.	SB 20.4, pp. 647, 649-655 LIM 20B	SB 20.4, p. 663 LIM p. 154
H.C.2B.4 Use mathematical and computational thinking to explain the relationship between mass and energy in nuclear reactions ($E=mc^2$).	SB 20.4, p. 648-649	SB 20.4, p. 663
BONDING AND CHEMICAL FORMULAS		
Standard H.C.3: The student will demonstrate an understanding of the structures and classification of chemical compounds.		
H.C.3A. Conceptual Understanding: Elements are made up of only one kind of atom. With increasing atomic number, a predictable pattern for the addition of electrons exists. This pattern is the basis for the arrangement of elements in the periodic table. The chemical properties of an element are determined by an element's electron configuration. Elements can react to form chemical compounds/molecules that have unique properties determined by the kinds of atoms combined to make up the compound/molecule. Essentially, the ways in which electrons are involved in bonds determines whether ionic or covalent bonds are formed. Compounds have characteristic shapes that are determined by the type and number of bonds formed. *Performance Indicators: Students who demonstrate this understanding can:*		

SC STANDARD	WHERE TAUGHT	WHERE TESTED
H.C.3A.1 Construct explanations for the formation of molecular compounds via sharing of electrons and for the formation of ionic compounds via transfer of electrons.	SB 7.1, pp. 199-203 SB 7.2, pp. 207-209 LIM 6C	SB 7.1, pp. 224-227
H.C.3A.2 Use the periodic table to write and interpret the formulas and names of chemical compounds (including binary ionic compounds, binary covalent compounds, and straight-chain alkanes up to six carbons).	SB 2.2, pp. 49-52 SB 7.3, pp 214-221 SB 8.1-8.2, pp. 230-244 LIM 7A	SB 2.2, p. 68 SB 7.3, p. 227 SB 8.2, p. 258 LIM p. 59-60
H.C.3A.3 Analyze and interpret data to predict the type of bonding (ionic or covalent) and the shape of simple compounds by using the Lewis dot structures and oxidation numbers.	SB 7.3, pp. 214-221 LIM 7A, 7B	SB 7.3, p. 227 LIM p. 659-62
H.C.3A.4 Plan and conduct controlled scientific investigations to generate data on the properties of substances and analyze the data to infer the types of bonds (including ionic, polar covalent, and nonpolar covalent) in simple compounds.	SB 7.1, pp. 201-206	SB 7.1, pp. 224-225
H.C.3A.5 Develop and use models (such as Lewis dot structures, structural formulas, or ball-and-stick models) of simple hydrocarbons to exemplify structural isomerism.	SB 7.3, pp. 214-221 LIM 7A, 7B	SB 7.3, p. 227 LIM p. 659-62
H.C.3A.6 Construct explanations of how the basic structure of common natural and synthetic polymers is related to their bulk properties.	SB 8.2, pp.240-244	SB 8.2, p. 257
H.C.3A.7 Analyze and interpret data to determine the empirical formula of a compound and the percent composition of a compound.	SB 8.4, pp. 250-253 LIM 8A	SB 8.4, p. 259 LIM p. 64
STATES OF MATTER		
Standard H.C.4: The student will demonstrate an understanding of the structure and behavior of the different states of matter.		
H.C.4A. Conceptual Understanding: Matter can exist as a solid, liquid, or gas, and in very high-energy states, as plasma. In general terms, for a given chemical, the particles making up the solid are at a lower energy state than the liquid phase, which is at a lower energy state than the gaseous phase. The changes from one state of matter into another are energy dependent. The behaviors of gases are dependent on the factors of pressure, volume, and temperature. *Performance Indicators: Students who demonstrate this understanding can:*		
H.C.4A.1 Develop and use models to explain the arrangement and movement of the particles in solids, liquids, gases, and plasma as well as the relative strengths of their intermolecular forces.	SB 3.3, pp. 88-94 SB 21.1, pp. 668-669	SB 3.3, p. 100-101 SB 21.1, p. 668
H.C.4A.2 Analyze and interpret heating curve graphs to explain that changes from one state of matter to another are energy dependent.	SB 3.3, pp. 88-90 LIM 3D	SB 3.3, p. 100-101 LIM p. 36
H.C.4A.3 Conduct controlled scientific investigations and use models to explain the behaviors of gases (including	LIM 14A-14B, pp. 119-120	LIM 14A-14B, p. 120, 122

SC STANDARD	WHERE TAUGHT	WHERE TESTED
the proportional relationships among pressure, volume, and temperature).	SB 14.2, pp. 450-456 LIM 14A	SB 14.2, pp.468-469 LIM p.118, 120
SOLUTIONS, ACIDS, AND BASES		
Standard H.C.5: The student will demonstrate an understanding of the nature and properties of various types of chemical solutions.		
H.C.5A. Conceptual Understanding: Solutions can exist in any of three physical states: gas, liquid, or solid. Solution concentrations can be expressed by specifying the relative amounts of solute and solvent. The nature of the solute, the solvent, the temperature, and the pressure can affect solubility. Solutes can affect such solvent properties as freezing point, boiling point, and vapor pressure. Acids, bases, and salts have characteristic properties. Several definitions of acids and bases are used in chemistry. *Performance Indicators: Students who demonstrate this understanding can:*		
H.C.5A.1 Obtain and communicate information to describe how a substance can dissolve in water by dissociation, dispersion, or ionization and how intermolecular forces affect solvation.	SB 9.1, pp. 262-269	SB 9.1, p. 291
H.C.5A.2 Analyze and interpret data to explain the effects of temperature and pressure on the solubility of solutes in a given amount of solvent.	SB 9.2, pp. 270-275	SB 9.2, p. 291. SB 9.2, p. 292-293
H.C.5A.3 Use mathematical representations to analyze the concentrations of unknown solutions in terms of molarity and percent by mass.	SB 2.3, SB 9.2, pp. 271-272, 277, 284 SB 13.2, p.416-420 SB 13.3, p. 422-426 LIM 9A, 9B	SB 9.2, p. 291. SB 9.2, p. 292-293 SB 13.2-13.3, pp. 438-439 LIM p. 68, 70-71
H.C.5A.4 Analyze and interpret data to describe the properties of acids, bases, and salts.	SB 4.3, p 124-125 SB 13.1, p. 410-415 LIM 10A; 13A-D	SB 4.3, p. 129
CHEMICAL REACTIONS		
Standard H.C.6: The student will demonstrate an understanding of the types, the causes, and the effects of chemical reactions.		
H.C.6A. Conceptual Understanding: A chemical reaction occurs when elements and/or compounds interact, resulting in a rearrangement of the atoms of these elements and/or compounds to produce substances with unique properties. Mass is conserved in chemical reactions. Reactions tend to proceed in a direction that favors lower energies. Chemical reactions can be categorized using knowledge about the reactants to predict products. Chemical reactions are quantifiable. When stress is applied to a chemical system that is in equilibrium, the system will shift in a direction that reduces that stress. *Performance Indicators: Students who demonstrate this understanding can:*		
H.C.6A.1 Develop and use models to predict the products of chemical reactions (1) based upon movements of ions; (2) based upon movements of protons; and (3) based upon movements of electrons.	SB 7.1, pp. 202-206 SB 7.2, pp. 207-213 SB 10.1, pp. 296-301 LIM 10B	SB 7.1-7.2, pp. 224-225 LIM p. 78
H.C.6A.2 Use Le Châtelier's principle to predict shifts in	SB 12.1, pp.378-	SB 12.1-12.2,

SC STANDARD	WHERE TAUGHT	WHERE TESTED
chemical equilibria resulting from changes in concentration, pressure, and temperature.	385; 12.2, pp. 386-389 LIM 12C	pp. 405-406, 407
H.C.6A.3 Plan and conduct controlled scientific investigations to produce mathematical evidence that mass is conserved in chemical reactions.	LIM 11A SB 4.2, p. 117 SB 11.1	LIM 11A, p. 86 SB 4.2, p. 130 SB 11.1, p. 360, 362-363
H.C.6A.4 Use mathematical and computational thinking to predict the amounts of reactants required and products produced in specific chemical reactions.	LIM 11A SB 11.1, pp. 330-338; 11.3, pp. 339-334	LIM 11A, p. 86 SB 11.1, p. 362 SB 11.3-11.4, p. 364-365
THERMOCHEMISTRY AND CHEMICAL KINETICS		
Standard H.C.7: The student will demonstrate an understanding of the conservation of energy and energy transfer.		
H.C.7A. Conceptual Understanding: The first law of thermodynamics states that the amount of energy in the universe is constant. An energy diagram is used to represent changes in the energy of the reactants and products in a chemical reaction. Enthalpy refers to the heat content that is present in an atom, ion, or compound. While some chemical reactions occur spontaneously, other reactions may require that activation energy be lowered in order for the reaction to occur. *Performance Indicators: Students who demonstrate this understanding can:*		
H.C.7A.1 Analyze and interpret data from energy diagrams and investigations to support claims that the amount of energy released or absorbed during a chemical reaction depends on changes in total bond energy.	SB 10.4, pp. 312-317	SB 10.4, p. 325
H.C.7A.2 Use mathematical and computational thinking to write thermochemical equations and draw energy diagrams for the combustion of common hydrocarbon fuels and carbohydrates, given molar enthalpies of combustion.	SB 10.4, pp. 312-317 SB 17.3, pp. 554-555	SB 10.4, p. 325 SB 17.3, p. 567
H.C.7A.3 Plan and conduct controlled scientific investigations to determine the effects of temperature, surface area, stirring, concentration of reactants, and the presence of various catalysts on the rate of chemical reactions.	SB 12.2, pp. 384-389; 12.4, pp. 389-401 LIM 12A, 12B (not including catalyst effect)	SB 12.2, pp. 405-406, 407 SB 12.4, p. 407 LIM 12A, p. 94, 12B, pp. 97-98
H.C.7A.4 Develop and use models to explain the relationships between collision frequency, the energy of collisions, the orientation of molecules, activation energy, and the rates of chemical reactions.	SB 12.1, pp. 368-377 LIM 12C	SB 12.1, p. 405 LIM p. 100