LAB-AIDS CORRELATIONS

SOUTH CAROLINA

HIGH SCHOOL LEVEL, CHEMISTRY

Din Seaver, Curriculum Development and Product Manager, Lab-Aids
Lisa Kelp, Vice President Learning and Development, Lab-Aids

This document is intended to show how *A Natural Approach to Chemistry, 3rd Edition* aligns with the South Carolina College- and Career-Ready Science Standards 2021.

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, Third Edition (©2024)

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 (instructional videos, Podcasts, PowerPoints, etc). All books are available in print or online through teacher and student portals, which also provide users access to the appropriate ancillary resources.

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

South Carolina Chemistry Standards	A Natural Approach to Chemistry, 3rd edition
Matter and Its Interactions (PS1)	
C-PS1-1. **Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.** ***Clarification Statement:*** *Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.* ***State Assessment Boundary:*** *Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.*	Student Text: 5.2, 6.3 Laboratory Investigations: 2B, 5A, 6A – C, 7A
C-PS1-2. **Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.** ***Clarification Statement:*** *Examples of chemical reactions could include the reaction of sodium and chlorine, carbon and oxygen, carbon and hydrogen, or biochemical reactions.* ***State Assessment Boundary:*** *Assessment is limited to chemical reactions involving main group elements and combustion reactions.*	Student Text: 4.2, 5.2, 6.2, 6.3 4, 10.3, 10.4, 13.1 Laboratory Investigations: 4B-C, 10A-C, 11A-B, 12A-B, 13B-D
C-PS1-3. **Plan and conduct an investigation to gather evidence to compare the structure of substances at a bulk scale to infer the strength of various forces between particles.** ***Clarification Statement:*** *Emphasis is on understanding the strengths of forces between particles, NOT on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Macroscopic properties of substances at the bulk scale could include the melting point and boiling point, vapor pressure, and surface tension.* ***State Assessment Boundary:*** *Assessment does not include Raoult's law calculations of vapor pressure.*	Student Text: 7.1, 8.1, 8.2 Laboratory Investigations: 3D, 4A, 8A, 14A, 16A
C-PS1-4. **Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.** ***Clarification Statement:*** *Emphasis is on the idea that a chemical reaction is a system that affects the energy change and is due to the absorption of energy when bonds are broken and the release of energy when new bonds*	Student Text: 4.2, 10.4 Laboratory Investigations: 4B, 10B, 10C

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are formed. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved. Examples could include photosynthesis and cell respiration. ***State Assessment Boundary:*** *Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.*	
C-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. ***Clarification Statement:*** *Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules. Examples could include enzymes or biocatalytic reactions.* ***State Assessment Boundary:*** *Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.*	Student Text: 12.1, 12.2 Laboratory Investigations: 12A-12C
 **C-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.** ***Clarification Statement:*** *Emphasis is on the application of Le Chatelier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants, removing products, or chemical kinetics.* ***State Assessment Boundary:*** *Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.*	Student Text: 12.1 -12.4 Laboratory Investigations: 12B, 12C
C-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. ***Clarification Statement:*** *Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale (stoichiometry). Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem- solving techniques.*	Student Text: 4.2, 10.2, 11.1-11.4 Laboratory Investigations: 4C, 11A–B, 13C–D, 14A

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State Assessment Boundary: *Assessment does not include complex chemical reactions.*	
C-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. ***Clarification Statement:*** *Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.* ***State Assessment Boundary:*** *Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.*	Student Text: 20.2-20.4 Laboratory Investigations: 20A – B
Motion and Stability: Forces and Interactions (PS2)	
C-PS2-6. Communicate scientific and technical information about why the molecular structure determines the functioning of designed materials. ***Clarification Statement:*** *Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.* ***State Assessment Boundary:*** *Assessment is limited to provided molecular structures of specific designed materials.*	Student Text: 12.3, 12.4, 15.4, 17.1, 17.2, 18.3 Laboratory Investigations: 15D, 17B, 18B, 18C
Energy (PS3)	
C-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). ***Clarification Statement:*** *Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.* ***State Assessment Boundary:*** *Assessment is limited to investigations based on materials and tools provided to students.*	Student Text: 3.2 Laboratory Investigations: 3A – D

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Waves and Their Applications in Technologies for Information Transfer (PS4)	
C-PS4-4. **Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.** ***Clarification Statement:*** *Emphasis is on the idea that particles associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.* ***State Assessment Boundary:*** *Assessment is limited to qualitative descriptions.*	Student Text: 5.2-5.4 Laboratory Investigations: 5B – D [Lab-Aids clarification statement: Investigate the effect of light frequencies, not evaluate claims]
C-PS4-5. **Communicate technical information about how some technological devices use the principles of the electromagnetic spectrum to cause matter to transmit and capture information and energy.** ***Clarification Statement:*** *Examples could include medical imaging and communications technology.* ***State Assessment Boundary:*** *Assessments are limited to qualitative information. Assessments do not include band theory.*	Student Text: 5.2-5.4, Chemistry Connections Laboratory Investigations: 5B – D