LAB-AIDS CORRELATIONS FOR THE OREGON SCIENCE STANDARDS

CHEMISTRY – GRADES 10-12

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 the Oregon Science Standards for chemistry. It is not an exhaustive list; other locations may exist that are not listed here.

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	Student Book		Lab Manual	
	Page	Detail	Page	Detail
H.1 Structure and Function: A system's characteristics, form, and function are attributed to the quantity, type, and nature of its components.				

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H.1P.1 Explain how atomic structure is related to the properties of elements and their position in the Periodic Table. Explain how the composition of the nucleus is related to isotopes and radioactivity.	137	Composition of an atom (Protons, neutrons, and electrons) explained	10	Mixtures of elements and their composition
	138	Isotopes defined in relation to the composition of the nucleus.	11	Setting up an atomic model
			53	Identifying elements and isotopes
	139	Radioactivity defined		
			153	Radioactive decay and raqdioactivity
	144	Various element's properties and their position on the periodic table		
	152	Electron configurations explained		
H.1P.2 Describe how different types and strengths of bonds affect the physical and chemical properties of compounds.	88	The relation between melting point and bond strength explained	11	How molecules are formed
			13	Building molecules with different types of bonds
	142	Strong nuclear force explained		
	147	Size of an atom depends on strength of attraction from the nucleus	58	Chemical bonds and valence
	231	Bonding patterns of ionic crystals		
H.2 Interaction and Change: The components in a system can interact in dynamic ways that may result in change. In systems, changes occur with a flow of energy and/or transfer of matter.				

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H.2P.1 Explain how chemical reactions result from the making and breaking of bonds in a process that absorbs or releases energy. Explain how the rate of a chemical reaction is affected by temperature, pressure, and concentration.	279	Examples of solutions releasing energy as bonds are broken	54	Example of element releasing energy
	368	Factors affecting reaction rates	92	Respiration reaction rate
	369	The idea of rate explained	95	Reaction rate and concetration
	370	Example of reaction with a measured rate		
	373	Molecular level example of when reactions explaining how rates are affected by collisions		
H.2P.2 Explain how physical and chemical changes demonstrate the law of conservation of mass.	117	Example of the law of conservation of mass	117	Relating molar mass to volume and temperature.
	298	Law of conservation of mass defined		
			43	Examples of chemical changes
	619	Example of Chemical and physical changes		

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H.2P.3 Describe the interactions of energy and matter including the law of conservation of energy.	28 28 29 29 29 298	Law of conservation of energy explained Examples of different ways people harvest energy Examples of the conservation of energy Explanation of how energy cannot be created Different forms of energy shown Conservation of energy and chemical reactions	41 81 91	Energy and chemical reactions Measuring the energy change of chemical reactions Absorption and release of energy by chemical reactions
H.2P.4 Apply the laws of motion and gravitation to describe the interaction of forces acting on an object and the resultant motion.		NA	NA	NA
H.3 Scientific Inquiry: Scientific inquiry is the investigation of the natural world by a systematic process that includes proposing a testable question or hypothesis and developing procedures for questioning, collecting, analyzing, and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations and new explorations.				

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H.3S.1 Based on observations and science principles formulate a question or hypothesis that can be investigated through the collection and analysis of relevant information.	20	Experiments and hypotheses	1, 67, 94	Formulating a hypothesis
	21	Setting up experiments		
	25, 295	Observing and drawing conclusions from scientific evidence and data		
H.3S.2 Design and conduct a controlled experiment, field study, or other investigation to make systematic observations about the natural world, including the collection of sufficient and appropriate data.	20	Example of an experiment and how to design one in order to collect sufficient and appropriate data	20, 104, 72, 68	Plotting data
			45	Oxidation-Reduction observations observed
	21	Variables explained		
	22	The importance of making systematic observations and the presence of error in experiments	64, 20	Data plotting and analysis
			170	Data plotting techniques
H.3S.3 Analyze data and identify uncertainties. Draw a valid conclusion, explain how it is supported by the evidence, and communicate the findings of a scientific investigation.	15	Uncertainty in scientific data	22	Coming to a conclusion that pennies are made from copper
	19	The structure of scientific investigations and uncertainty	94	Yeast respiration conclusion and uncertainty
	24	Drawing conclusions from data		
	25	Drawing evidence from observation	171	Uncertainty in data explained
	26	Scientific method explained		

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H.3S.4 Identify examples from the history of science that illustrate modification of scientific knowledge in light of challenges to prevailing explanations.	19 25	Ancient examples of scientific inquiry, and the developments of theories. Example of Galileo's sketches of the moon, representing evidence that is objective and repeatable		
H.3S.5 Explain how technological problems and advances create a demand for new scientific knowledge and how new knowledge enables the creation of new technologies.	30 634 645	Advances in measuring devices The use of nuclear science for medical applications Radioactive decay and the application of carbon dating		
H.4 Engineering Design: Engineering design is a process of formulating problem statements, identifying criteria and constraints, proposing and testing possible solutions, incorporating modifications based on test data, and communicating the recommendations.				
H.4D.1 Define a problem and specify criteria for a solution within specific constraints or limits based on science principles. Generate several possible solutions to a problem and use the concept of trade-offs to compare them in terms of criteria and constraints.	23, 375, 319	Defining the constraints and criteria for an engineering problem. Examples of biodegreada ble plastics, dry cleaning and PERC, chemical manufacturing	135 148	Oil spills and methods for cleaning up Investigating the water cycle.

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H.4D.2 Create and test or otherwise analyze at least one of the more promising solutions. Collect and process relevant data. Incorporate modifications based on data from testing or other analysis.	144, 191, 217, 295, 413, 447, 670	Examples of testing possible solutions for physical and chemical phenomena (ranging from quantum to molecular geometry, to valance electrons, to acids and bases, to pressure to star formation and chemistry)	4 67 87 108	Develop possible exaplanations for the explanation of color formation Develop a method for the determination of sugar in drinks Analysis and testing for the determination of reaction yield Develop and test titration techniques
H.4D.3 Analyze data, identify uncertainties, and display data so that the implications for the solution being tested are clear.	15, 24, 164, 390, 451	Analyze data, determining error and coming to a conclusion	95,108, 118, 139	Estimate the effect of error and uncertainty in data collection and experimentation
H.4D.4 Recommend a proposed solution, identify its strengths and weaknesses, and describe how it is better than alternative designs. Identify further engineering that might be done to refine the recommendations.	318 320, 321	Evaluate the design of chemical manufacturing via the process of waste minimization. Green chemistry as a tool for obtaining alternate efficient chemical processes.	124	Relating experimental observations to system performance. Energy use and efficiency of electrochemical sysstems.
H.4D.5 Describe how new technologies enable new lines of scientific inquiry and are largely responsible for changes in how people live and work.	634, 645 318	Using nuclear chemical techniques in engineering and health The development and use of green chemistry technology.		

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H.4D.6 Evaluate ways that ethics, public opinion, and government policy influence the work of engineers and scientists, and how the results of their work impact human society and the environment.	326, 336	Stoichiometry and how it helps to address environmental restrictions and regulations		
	357	Environmental polution guidelines and chemical processes		
	385	Addressing environmental chemical issues by affecting the direction of chemical reactions		