CORRELATIONS FOR THE CONNECTICUT 2005 SCIENCE CORE CURRICULUM FRAMEWORK

GRADES 10-12 – 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 the Connecticut 2005 Science Standards for chemistry (http://www.sde.ct.gov/sde/cwp/view.asp?a=2618&q=320890). It is not an exhaustive list; other locations may exist that are not listed here.

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Content Standards	NAC Student Book	NAC Lab Manual
Atomic and Molecular Structure The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure.		
▪ The nucleus of the atom is much smaller than the atom, yet contains most of its mass.	• 5.1, pp. 136-137	5A
▪ The quantum model of the atom is based on experiments and analyses by many scientists, including Dalton, Thomson, Bohr, Rutherford, Millikan and Einstein.	• 5.1, pp. 135-136, 144	
▪ The position of an element in the periodic table is related to its atomic number.	• 5.1, p. 138; 6.1, p. 175	
▪ The periodic table can be used to identify metals, semimetals, non-metals and halogens.	• 6.2, pp. 177-182	6A, 6B, 6C
▪ The periodic table can be used to identify trends in ionization energy, electronegativity, the relative sizes of ions and atoms, and the number of electrons available for bonding.	• 6.1, pp. 172-173; 6.3, pp. 186-188	
▪ The electronic configuration of elements and their reactivity can be identified based on their position in the periodic table.	• 5.2, pp. 151-154	
Chemical Bonds Biological, chemical and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.		
▪ Atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.	• 7.1, pp. 198-201	7A, 7B
▪ Chemical bonds between atoms in molecules such as H2, CH4, NH3, H2CCH2, N2, Cl2, and many large biological molecules are covalent.	• 7.1, p. 202, 204, 212; 17.1, p. 538	7A, 7B
▪ Salt crystals, such as NaCl, are repeating patterns of positive and negative ions held together by electrostatic attraction.	• 7.1, p. 203-204	
▪ The atoms and molecules in liquids move in a random pattern relative to one another because the intermolecular forces are too weak to hold the atoms or molecules in a	• 9.1, p. 263; 16.4, p. 525	16A, 16B

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solid form.		
▪ Lewis dot structures can provide models of atoms and molecules.	• 7.3, pp. 214-217	7A, 7B
▪ The shape of simple molecules and their polarity can be predicted from Lewis dot structures.	• 7.3, pp. 214-217	
▪ Electronegativity and ionization energy are related to bond formation.	• 6.1, p. 173	
▪ Solids and liquids held together by Van der Waals forces or hydrogen bonds are affected by volatility and boiling/melting point temperatures.	• 9.1, pp. 263-264; 16.1, pp. 511-512	16A, 16B
Conservation of Matter and Stoichiometry The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants.		
▪ Chemical reactions can be described by writing balanced equations.	• 10.1, pp. 296-301	10B
▪ The quantity one mole is set by defining one mole of carbon; 12 atoms to have a mass of exactly 12 grams.	• 2.1, pp. 45-46	2B
▪ One mole equals 6.02.x 1023 particles (atoms or molecules).	• 2.1, pp. 45-46	
▪ The molar mass of a molecule can be determined from its chemical formula and a table of atomic masses.	• 2.2, pp. 53-55	
▪ The mass of a molecular substance can be converted to moles, number of particles, or volume of gas at standard temperature and pressure.	• 14.3, pp. 462-465	14A
▪ Hess's law is used to calculate enthalpy change in a reaction.	• 10.4, p. 317	10C
Reaction Rates Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.		
▪ The rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time.	• 12.1, p. 370-372 • 12.1, p. 368	12A, 12B
▪ Reaction rates depend on factors such as concentration, temperature and pressure.		
▪ Equilibrium is established when forward and reverse reaction rates are equal.	• 12.2, pp. 378-382	12C
▪ Catalysts play a role in increasing the reaction rate by changing the activation energy in a chemical reaction	• 12.4, pp. 398-401	18B
Organic Chemistry and Biochemistry The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes and chemical properties, and provide the biochemical basis of life.		
▪ Large molecules (polymers), such as proteins, nucleic acids and starch, are formed by repetitive combinations of organic monomers.	• 8.2, pp. 240-242; 17.1, pp. 538, 547, 559; 18.1, pp. 570-572; p.585	8B, 18B, 18C
▪ The bonding characteristics of carbon result in the formation of a large variety of structures, ranging from simple hydrocarbons to complex biological molecules and synthetic polymers.	• 6.2, p. 180; 8.2, p. 242; 17.1, p. 538	6B, 6C
▪ Amino acids are the building blocks of proteins.	• 18.3, pp. 584-586	18C