CHEMISTRY
INQUIRY, REFLECTION, AND SOCIAL IMPLICATIONS

HSCE		Activities	Resources/Materials	Assessment
C1.1	**Scientific Inquiry** Science is a way of understanding nature. Scientific research may begin by generating new scientific questions that can be answered through replicable scientific investigations that are logically developed and conducted systematically. Scientific conclusions and explanations result from careful analysis of empirical evidence and the use of logical reasoning. Some questions in science are addressed through indirect rather than direct observation, evaluating the consistency of new evidence with results predicted by models of natural processes. Results from investigations are communicated in reports that are scrutinized through a peer review process.	Standard C1 is covered throughout the entire curriculum.		
C1.1A	Generate new questions that can be investigated in the laboratory or field.	Class Discussion Labs Extra Credit	Add New Questions to existing labs.	
C1.1B	Evaluate the uncertainties or validity of scientific conclusions using an understanding of sources of measurement error, the challenges of controlling variables, accuracy of data analysis, logic of argument, logic of experimental design, and/or the dependence on underlying assumptions.	Chapter 3—Sig. Fig. Lecture Labs Text/classwork/homework tests Unit 1: Introduction, Significant Figures & Element Names Chapters 1 - 3		
C1.1C	Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity—length, volume, weight, time interval, temperature—with the appropriate level of precision).	Labs Lab instruments and safety important here Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C1.1D	Identify patterns in data and relate them to theoretical models.	Labs Lecture Homework/classwork		
C1.1E	Describe a reason for a given conclusion using evidence from an investigation.	Labs Unit 12: Acids, Bases, pH and		

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		Neutralization Reactions Chapters 20 & 21		
C1.1f	Predict what would happen if the variables, methods, or timing of an investigation were changed.	Labs Lecture Homework/classwork	Add New Questions to existing labs.	
C1.1g	Based on empirical evidence, explain and critique the reasoning used to draw a scientific conclusion or explanation.	Labs Unit 5: Chemical Reactions Chapter 8 Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21	Add more questions on analysis of experimental technique (assumptions etc.) and error.	
C1.1h	Design and conduct a systematic scientific investigation that tests a hypothesis. Draw conclusions from data presented in charts or tables.	Design & Conduct: Labs Draw conclusions: Labs, Test, homework and classwork. Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21	Rewrite existing labs Test/homework/classwork questions that ask students to conduct thought experiments.	
C1.1i	Distinguish between scientific explanations that are regarded as current scientific consensus and the emerging questions that active researchers investigate.	Class Discussion Unit 1: Introduction, Significant Figures & Element Names Chapters 1 – 3 Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21	Emphasize applications and limitations of models used in chemistry.	
C1.2	**Scientific Reflection and Social Implications** The integrity of the scientific process depends on scientists and citizens understanding and respecting the "Nature of Science." Openness to new ideas, skepticism, and honesty are attributes required for good scientific practice. Scientists must use logical reasoning during investigation design, analysis, conclusion, and communication. Science can produce critical insights on societal problems from a personal and local scale to a global scale. Science both	Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		

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	aids in the development of technology and provides tools for assessing the costs, risks, and benefits of technological systems. Scientific conclusions and arguments play a role in personal choice and public policy decisions. New technology and scientific discoveries have had a major influence in shaping human history. Science and technology continue to offer diverse and significant career opportunities.			
C1.2A	Critique whether or not specific questions can be answered through scientific investigations.	Class discussion Textbook/homework/classwork Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21	Supplementary special topics (articles/current events etc.)	
C1.2B	Identify and critique arguments about personal or societal issues based on scientific evidence.	Class Discussion Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21	Supplementary special topics (articles/current events etc.)	
C1.2C	Develop an understanding of a scientific concept by accessing information from multiple sources. Evaluate the scientific accuracy and significance of the information.	Class Discussion Textbook	Supplementary materials from media (Newspaper, periodicals, internet)	
C1.2D	Evaluate scientific explanations in a peer review process or discussion format.	Lab groups and class discussion		
C1.2E	Evaluate the future career and occupational prospects of science fields.	Class discussion Textbook (back of book) Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21	Videos	
C1.2f	Critique solutions to problems, given criteria and scientific constraints.	Class discussion Textbook Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C1.2g	Identify scientific tradeoffs in design decisions and choose among alternative solutions.	Class discussion Textbook		

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HSCE		Activities	Resources/Materials	Assessment
		Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C1.2h	Describe the distinctions between scientific theories, laws, hypotheses, and observations.	Class discussion Textbook Unit 1: Introduction, Significant Figures & Element Names Chapters 1 - 3		
C1.2i	Explain the progression of ideas and explanations that lead to science theories that are part of the current scientific consensus or core knowledge.	5.1, 13.1 & 13.3 Class discussion Textbook Atomic theory Development of the periodic table Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C1.2j	Apply science principles or scientific data to anticipate effects of technological design decisions.	Class discussion Textbook Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C1.2k	Analyze how science and society interact from a historical, political, economic, or social perspective.	Class discussion Textbook Development of atomic theory Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21	Additional topics such as waste disposal, energy sources, mercury, lead, pestisides etc.	

CHEMISTRY
FORMS OF ENERGY

HSCE		Activities	Resources/Materials	Assessment
P2.p1	Potential Energy *(prerequisite)*Three forms of potential energy are gravitational, elastic, and chemical. Objects can have elastic potential energy due totheir compression or chemical potential energy due to the arrangement of the atoms. *(prerequisite)*			
P2.p1A	Describe energy changes associated with changes of state in terms of the arrangement and order of the atoms (molecules) in each state. *(prerequisite)*	Kinetic Molecular Theory		
P2.p1B	Use the positions and arrangements of atoms and molecules in solid, liquid, and gas state to explain the need for an input of energy for melting and boiling and a release of energy in condensation and freezing. *(prerequisite)*	Chapter 11-Thermochemisty Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		
C2.1x	**Chemical Potential Energy** Potential energy is stored whenever work must be done to change the distance between two objects. The attraction between the two objects may be gravitational, electrostatic, magnetic, or strong force. Chemical potential energy is the result of electrostatic attractions between atoms.			
C2.1a	Explain the changes in potential energy (due to electrostatic interactions) as a chemical bond forms and use this to explain why bond breaking always requires energy.	Lecture only Chapter 11 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		
C2.1b	Describe energy changes associated with chemical reactions in terms of bonds broken and formed (including intermolecular forces).	Lecture, Text, Class Discussion Homework		
C2.1c	Compare qualitatively the energy changes associated with melting various types of solids in terms of the types of forces between the particles in the solid.	Chapter 11 Bonding, M.P. B.P. Lecture, Text, Class Discussion Homework Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		

HSCE		Activities	Resources/Materials	Assessment
C2.2	**Molecules in Motion** Molecules that compose matter are in constant motion (translational, rotational, and vibrational). Energy may be transferred from one object to another during collisions between molecules.			
C2.2A	Describe conduction in terms of molecules bumping into each other to transfer energy. Explain why there is better conduction in solids and liquids than gases.	Chapter 10	Need to add materials on conduction	
C2.2B	Describe the various states of matter in terms of the motion and arrangement of the molecules (atoms) making up the substance.	Chapters 10, 11, 12 Kinetic Molecular Theory Lecture, Text, Class Discussion Homework Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		
C2.2x	**Molecular Entropy** As temperature increases, the average kinetic energy and the entropy of the molecules in a sample increases.	Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C2.2c	Explain changes in pressure, volume, and temperature for gases using the kinetic molecular model.	Chapter 10.1 Unit 8: Gal Laws and Kinetic Molecular Theory of Gases Chapters/Sections 10.1 & 12		
C2.2d	Explain convection and the difference in transfer of thermal energy for solids, liquids, and gases using evidence that molecules are in constant motion.	Chapter 10	Demo—heat + H2O + Pepper???	
C2.2e	Compare the entropy of solids, liquids, and gases.	Chapter 19.3 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C2.2f	Compare the average kinetic energy of the molecules in a metal object and a wood object at room temperature.	Chapter 10.1, 19.1?? (not specifically stated in book) Unit 11: Chemical Equilibrium & Kinetics		

HSCE		Activities	Resources/Materials	Assessment
		Chapter 19		
C2.3x	**Breaking Chemical Bonds** For molecules to react, they must collide with enough energy (activation energy) to break old chemical bonds before their atoms can be rearranged to form new substances.	Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C2.3a	Explain how the rate of a given chemical reaction is dependent on the temperature and the activation energy.	Chapter 19.1 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C2.3b	Draw and analyze a diagram to show the activation energy for an exothermic reaction that is very slow at room temperature.	Chapter 19.1 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C2.4x	**Electron Movement** For each element, the arrangement of electrons surrounding the nucleus is unique. These electrons are found in different energy levels and can only move from a lower energy level (closer to nucleus) to a higher energy level (farther from nucleus) by absorbing energy in discrete packets. The energy content of the packets is directly proportional to the frequency of the radiation. These electron transitions will produce unique absorption spectra for each element. When the electron returns from an excited (high energy state) to a lower energy state, energy is emitted in only certain wavelengths of light, producing an emission spectra**.**			
C2.4a	Describe energy changes in flame tests of common elements in terms of the (characteristic) electron transitions.	Chapter 13.3 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C2.4b	Contrast the mechanism of energy changes and	Chapter 13		

HSCE		Activities	Resources/Materials	Assessment
	the appearance of absorption and emission spectra.	Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C2.4c	Explain why an atom can absorb only certain wavelengths of light.	Chapter 13 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C2.4d	Compare various wavelengths of light (visible and nonvisible) in terms of frequency and relative energy.	Chapter 13 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C2.5x	**Nuclear Stability** Nuclear stability is related to a decrease in potential energy when the nucleus forms from protons and neutrons. If the neutron/proton ratio is unstable, the element will undergo radioactive decay. The rate of decay is characteristic of each isotope; the time for half the parent nuclei to decay is called the half-life. Comparison of the parent/daughter nuclei can be used to determine the age of a sample. Heavier elements are formed from the fusion of lighter elements in the stars.			
C2.5a	Determine the age of materials using the ratio of stable and unstable isotopes of a particular type.	Chapter 28.2 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C2.r5b	Illustrate how elements can change in nuclear reactions using balanced equations. *(recommended)*	Chapter 28.1 & 28.2 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		

HSCE		Activities	Resources/Materials	Assessment
C2.r5c	Describe the potential energy changes as two protons approach each other. *(recommended)*	Chapter 28		
C2.r5d	Describe how and where all the elements on earth were formed. *(recommended)*	Chapter 28		

HSCE		Activities	Resources/Materials	Assessment
P3.p1	**Conservation of Energy** *(prerequisite)* When energy is transferred from one system to another, the quantity of energy before transfer equals the quantity of energy after transfer. *(prerequisite)*			
P3.p1A	Explain that the amount of energy necessary to heat a substance will be the same as the amount of energy released when the substance is cooled to the original temperature. *(prerequisite)*			
C3.1x	**Hess's Law** For chemical reactions where the state and amounts of reactants and products are known, the amount of energy transferred will be the same regardless of the chemical pathway. This relationship is called Hess's law.			
C3.1a	Calculate the ΔH for a given reaction using Hess's Law.	Chapter 11.4 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		
C3.1b	Draw enthalpy diagrams for exothermic and endothermic reactions.	Chapter 11.4 Class notes Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		
C3.1c	Calculate the ΔH for a chemical reaction using simple coffee cup calorimetry.	Chapter 11.2 Lab Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		
C3.1d	Calculate the amount of heat produced for a given mass of reactant from a balanced chemical equation.	Chapter 11.2 Notes/Discussion Skills Practice Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		

HSCE		Activities	Resources/Materials	Assessment
P3.P2	**Energy Transfer** *(prerequisite)* Nuclear reactions take place in the sun. In plants, light from the sun is transferred to oxygen and carbon compounds, which, in combination, have chemical potential energy (photosynthesis). *(prerequisite)*			
P3.P2a	Trace (or diagram) energy transfers involving various types of energy including nuclear, chemical, electrical, sound, and light. *(prerequisite)*			
C3.2x	**Enthalpy** Chemical reactions involve breaking bonds in reactants (endothermic) and forming new bonds in the products (exothermic). The enthalpy change for a chemical reaction will depend on the relative strengths of the bonds in the reactants and products.			
C3.2a	Describe the energy changes in photosynthesis and in the combustion of sugar in terms of bond breaking and bond making.	Chapter 11 Chip Lab Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		
C3.2b	Describe the relative strength of single, double, and triple covalent bonds between nitrogen atoms.	Chapter 16 Unit 9: Ionic Bonding, Covalent Bonding, Metallic Bonding & Crystal Structure Chapter/Sections 10.3, 15, 16.1 & 16.2		
C3.3	**Heating Impacts** Heating increases the kinetic (translational, rotational, and vibrational) energy of the atoms composing elements and the molecules or ions composing compounds. As the kinetic (translational) energy of the atoms, molecules, or ions increases, the temperature of the matter increases. Heating a sample of a crystalline solid increases the kinetic (vibrational) energy of the	Unit 8: Gal Laws and Kinetic Molecular Theory of Gases Chapters/Sections 10.1 & 12		

HSCE		Activities	Resources/Materials	Assessment
	atoms, molecules, or ions. When the kinetic (vibrational) energy becomes great enough, the crystalline structure breaks down, and the solid melts.			
C3.3A	Describe how heat is conducted in a solid.	Chapter 10 Unit 9: Ionic Bonding, Covalent Bonding, Metallic Bonding & Crystal Structure Chapter/Sections 10.3, 15, 16.1 & 16.2		
C3.3B	Describe melting on a molecular level.	Chapter 11, 19.1 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C3.3x	**Bond Energy** Chemical bonds possess potential (vibrational and rotational) energy.			
C3.3c	Explain why it is necessary for a molecule to absorb energy in order to break a chemical bond.	Chapter 11 & 19 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C3.4	**Endothermic and Exothermic Reactions** Chemical interactions either release energy to the environment (exothermic) or absorb energy from the environment (endothermic).			
C3.4A	Use the terms endothermic and exothermic correctly to describe chemical reactions in the laboratory.	Chapter 11.1 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		

HSCE		Activities	Resources/Materials	Assessment
C3.4B	Explain why chemical reactions will either release or absorb energy.	Chapter 11.2 & 19 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C3.4x	**Enthalpy and Entropy** All chemical reactions involve rearrangement of the atoms. In an exothermic reaction, the products have less energy than the reactants. There are two natural driving forces: (1) toward minimum energy (enthalpy) and (2) toward maximum disorder (entropy).			
C3.4c	Write chemical equations including the heat term as a part of equation or using ΔH notation.	Chapter 11.2 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		
C3.4d	Draw enthalpy diagrams for reactants and products in endothermic and exothermic reactions.	Chapter 11.2 & 19.1 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C3.4e	Predict if a chemical reaction is spontaneous given the enthalpy (ΔH) and entropy (ΔS) changes for the reaction using Gibb's Free Energy, $\Delta G = \Delta H - T\Delta S$ (Note: mathematical computation of ΔG is not required.)	Chapter 19.4 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C3.4f	Explain why some endothermic reactions are spontaneous at room temperature.	Chapter 19.3 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		

HSCE		Activities	Resources/Materials	Assessment
C3.4g	Explain why gases are less soluble in warm water than cold water.	Chapter 18.1, 19.1?? (book does not explain why) (Dispersion forces α to distance)		
C3.5x	**Mass Defect** Nuclear reactions involve energy changes many times the magnitude of chemical changes. In chemical reactions matter is conserved, but in nuclear reactions a small loss in mass (mass defect) will account for the tremendous release of energy. The energy released in nuclear reactions can be calculated from the mass defect using $E = mc2$.			
C3.5a	Explain why matter is not conserved in nuclear reactions.	Chapter 28.1 & 28.2 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		

HSCE		Activities	Resources/Materials	Assessment
P4.p1	**Kinetic Molecular Theory** *(prerequisite)* Properties of solids, liquids, and gases are explained by a model of matter that is composed of tiny particles in motion. *(prerequisite)*	Chapter 10.1 Unit 8: Gal Laws and Kinetic Molecular Theory of Gases Chapters/Sections 10.1 & 12		
P4.p1A	For a substance that can exist in all three phases, describe the relative motion of the particles in each of the phases. (prerequisite)	Prerequisite + Chapters 2 & 10 Unit 1: Introduction, Significant Figures & Element Names Chapters 1 - 3		
P4.p1B	For a substance that can exist in all three phases, make a drawing that shows the arrangement and relative spacing of the particles in each of the phases. *(prerequisite)*	Prerequisite + Chapters 2 & 10 Unit 1: Introduction, Significant Figures & Element Names Chapters 1 - 3		
P4.p1C	For a simple compound, present a drawing that shows the number of particles in the system does not change as a result of a phase change. *(prerequisite)*	Prerequisite + Chapters 2 & 10 Unit 1: Introduction, Significant Figures & Element Names Chapters 1 - 3		
P4.p2	**Elements, Compounds, and Mixtures** *(prerequisite)* Elements are a class of substances composed of a single kind of atom. Compounds are composed of two or more different elements chemically combined. Mixtures are composed of two or more different elements and/or compounds physically combined. Each element and compound has physical and chemical properties, such as boiling point, density, color, and conductivity, which are independent of the amount of the sample. *(prerequisite)*	Unit 1: Introduction, Significant Figures & Element Names Chapters 1 - 3		
P4.p2A	Distinguish between an element, compound, or mixture based on drawings or formulae. *(prerequisite)*	Prerequisite + Chapters 2 Unit 1: Introduction, Significant Figures & Element Names Chapters 1 - 3		
P4.p2B	Identify a pure substance (element or compound) based on unique chemical and physical properties. *(prerequisite)*	Prerequisite + Chapters 2 Unit 1: Introduction, Significant Figures & Element Names		

HSCE		Activities	Resources/Materials	Assessment
		Chapters 1 - 3		
P4.p2C	Separate mixtures based on the differences in physical properties of the individual components. *(prerequisite)*	Prerequisite + Chapters 2 Unit 1: Introduction, Significant Figures & Element Names Chapters 1 - 3		
P4.p2D	Recognize that the properties of a compound differ from those of its individual elements. *(prerequisite)*	Prerequisite + Chapters 2 Unit 1: Introduction, Significant Figures & Element Names Chapters 1 - 3		
C4.1x	**Molecular and Empirical Formulae** Compounds have a fixed percent elemental composition. For a compound, the empirical formula can be calculated from the percent composition or the mass of each element. To determine the molecular formula from the empirical formula, the molar mass of the substance must also be known.			
C4.1a	Calculate the percent by weight of each element in a compound based on the compound formula.	Chapter 7.3 Unit 2: Dimensional Analysis, Unit Conversions and the Mole Chapters 4 & 7		
C4.1b	Calculate the empirical formula of a compound based on the percent by weight of each element in the compound.	Chapter 7.3 Unit 2: Dimensional Analysis, Unit Conversions and the Mole Chapters 4 & 7		
C4.1c	Use the empirical formula and molecular weight of a compound to determine the molecular formula.	Chapter 7.3 Unit 2: Dimensional Analysis, Unit Conversions and the Mole Chapters 4 & 7		
C4.2	**Nomenclature** All compounds have unique names that are determined systematically.			
C4.2A	Name simple binary compounds using their formulae.	Chapter 6.4 Unit 4: Naming Ionic Compounds, Covalent Compounds, Acids and		

HSCE		Activities	Resources/Materials	Assessment
		Hydrocarbons Chapter/Sections 6 & 25.1		
C4.2B	Given the name, write the formula of simple binary compounds.	Chapter 6.4 Unit 4: Naming Ionic Compounds, Covalent Compounds, Acids and Hydrocarbons Chapter/Sections 6 & 25.1		
C4.2x	**Nomenclature** All molecular and ionic compounds have unique names that are determined systematically.			
C4.2c	Given a formula, name the compound.	Chapter 6.3 Unit 4: Naming Ionic Compounds, Covalent Compounds, Acids and Hydrocarbons Chapter/Sections 6 & 25.1		
C4.2d	Given the name, write the formula of ionic and molecular compounds.	Chapter 6.3, 6.4 & 6.5 Unit 4: Naming Ionic Compounds, Covalent Compounds, Acids and Hydrocarbons Chapter/Sections 6 & 25.1		
C4.2e	Given the formula for a simple hydrocarbon, draw and name the isomers.	Chapter 25.1, 25.2 & 25.3 Unit 4: Naming Ionic Compounds, Covalent Compounds, Acids and Hydrocarbons Chapter/Sections 6 & 25.1 Unit 13: Select Organic Functional Groups & Polymer Chapter/Sections 25.1, 25.3 & 26.4		
C4.3	**Properties of Substances** Differences in the physical and chemical properties of substances are explained by the arrangement of the atoms, ions, or molecules of the substances and by the strength of the forces			

HSCE		Activities	Resources/Materials	Assessment
	of attraction between the atoms, ions, or molecules.			
C4.3A	Recognize that substances that are solid at room temperature have stronger attractive forces than liquids at room temperature, which have stronger attractive forces than gases at room temperature.	Chapters 2, 10.1, 10.2 & 10.3 Unit 1: Introduction, Significant Figures & Element Names Chapters 1 – 3 Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		
C4.3B	Recognize that solids have a more ordered, regular arrangement of their particles than liquids and that liquids are more ordered than gases.	Chapters 2, 10.2 & 10.3 Unit 1: Introduction, Significant Figures & Element Names Chapters 1 - 3		
C4.3x	**Solids** Solids can be classified as metallic, ionic, covalent, or network covalent. These different types of solids have different properties that depend on the particles and forces found in the solid.			
C4.3c	Compare the relative strengths of forces between molecules based on the melting point and boiling point of the substances.	Chapter 10.2, 10.3 & 16.3 Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		
C4.3d	Compare the strength of the forces of attraction between molecules of different elements. (For example, at room temperature, chlorine is a gas and iodine is a solid.)	Chapter 10.2 & 16.3 (Does this really mean only element molecules—i.e. the halogens—or molecules of compounds and element?) Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		

HSCE		Activities	Resources/Materials	Assessment
C4.3e	Predict whether the forces of attraction in a solid are primarily metallic, covalent, network covalent, or ionic based upon the elements' location on the periodic table.	Chapters 6 (intro), 14.2, 15 & 16.3 Unit 9: Ionic Bonding, Covalent Bonding, Metallic Bonding & Crystal Structure Chapter/Sections 10.3, 15, 16.1 & 16.2		
C4.3f	Identify the elements necessary for hydrogen bonding (N, O, F).	Chapter 16.3 Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		
C4.3g	Given the structural formula of a compound, indicate all the intermolecular forces present (dispersion, dipolar, hydrogen bonding).	Chapter 16.3 Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		
C4.3h	Explain properties of various solids such as malleability, conductivity, and melting point in terms of the solid's structure and bonding.	Chapters 6 (intro), 15.2, 15.3 & 16.3 Unit 9: Ionic Bonding, Covalent Bonding, Metallic Bonding & Crystal Structure Chapter/Sections 10.3, 15, 16.1 & 16.2		
C4.3i	Explain why ionic solids have higher melting points than covalent solids. (For example, NaF has a melting point of 995°C while water has a melting point of 0° C.)	Chapters 6, 10, 15 & 16 Unit 9: Ionic Bonding, Covalent Bonding, Metallic Bonding & Crystal Structure Chapter/Sections 10.3, 15, 16.1 & 16.2		
C4.4x	**Molecular Polarity** The forces between molecules depend on the net polarity of the molecule as determined by shape of the molecule and the polarity of the bonds.	16.3 Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		

HSCE		Activities	Resources/Materials	Assessment
C4.4a	Explain why at room temperature different compounds can exist in different phases.	Chapters 10, 15 & 16 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11 Unit 9: Ionic Bonding, Covalent Bonding, Metallic Bonding & Crystal Structure Chapter/Sections 10.3, 15, 16.1 & 16.2 Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		
C4.4b	Identify if a molecule is polar or nonpolar given a structural formula for the compound.	Chapter 16 Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		
C4.5x	**Ideal Gas Law** The forces in gases are explained by the ideal gas law.	12.4		
C4.5a	Provide macroscopic examples, atomic and molecular explanations, and mathematical representations (graphs and equations) for the pressure-volume relationship in gases.	Chapter 12.1, 12.2 & 12.3 Unit 8: Gal Laws and Kinetic Molecular Theory of Gases Chapters/Sections 10.1 & 12		
C4.5b	Provide macroscopic examples, atomic and molecular explanations, and mathematical representations (graphs and equations) for the pressure-temperature relationship in gases.	Chapter 12.1, 12.2 & 12.3 Unit 8: Gal Laws and Kinetic Molecular Theory of Gases Chapters/Sections 10.1 & 12		
C4.5c	Provide macroscopic examples, atomic and molecular explanations, and mathematical representations (graphs and equations) for the temperature-volume relationship in gases.	Chapter 12.1, 12.2 & 12.3 Unit 8: Gal Laws and Kinetic Molecular Theory of Gases Chapters/Sections 10.1 & 12		

HSCE		Activities	Resources/Materials	Assessment
C4.6x	**Moles** The mole is the standard unit for counting atomic and molecular particles in terms of common mass units.	Unit 2: Dimensional Analysis, Unit Conversions and the Mole Chapters 4 & 7		
C4.6a	Calculate the number of moles of any compound or element given the mass of the substance.	Chapter 7.2 Unit 2: Dimensional Analysis, Unit Conversions and the Mole Chapters 4 & 7		
C4.6b	Calculate the number of particles of any compound or element given the mass of the substance.	Chapter 7.2 Unit 2: Dimensional Analysis, Unit Conversions and the Mole Chapters 4 & 7		
C4.7x	**Solutions** The physical properties of a solution are determined by the concentration of solute.	Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		
C4.7a	Investigate the difference in the boiling point or freezing point of pure water and a salt solution.	Chapter 18.3 & 18.4 Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		
C4.7b	Compare the density of pure water to that of a sugar solution.	Chapter 18.2 Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		
C4.8	**Atomic Structure** Electrons, protons, and neutrons are parts of the atom and have measurable properties, including mass and, in the case of protons and electrons, charge. The nuclei of atoms are composed of protons and neutrons. A kind of force that is only evident at nuclear distances holds the particles of the nucleus together against the electrical repulsion between the protons.			

HSCE		Activities	Resources/Materials	Assessment
C4.8A	Identify the location, relative mass, and charge for electrons, protons, and neutrons.	Chapter 5.2 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C4.8B	Describe the atom as mostly empty space with an extremely small, dense nucleus consisting of the protons and neutrons and an electron cloud surrounding the nucleus.	Chapter 5.1, 5.2 & 5.3 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C4.8C	Recognize that protons repel each other and that a strong force needs to be present to keep the nucleus intact.	Chapter 5 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C4.8D	Give the number of electrons and protons present if the fluoride ion has a -1 charge.	Chapter 5 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C4.8x	**Electron Configuration** Electrons are arranged in main energy levels with sublevels that specify particular shapes and geometry. Orbitals represent a region of space in which an electron may be found with a high level of probability. Each defined orbital can hold two electrons, each with a specific spin orientation. The specific assignment of an electron to an orbital is determined by a set of 4 quantum numbers. Each element and, therefore, each position in the periodic table is defined by a unique set of quantum numbers.			
C4.8e	Write the complete electron configuration of elements in the first four rows of the periodic table.	Chapter 13.2 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13,		

HSCE		Activities	Resources/Materials	Assessment
		14 (part) & 24 (part)		
C4.8f	Write kernel structures for main group elements.	Chapter 13.2, 15.1 (Noble Gas Core) Current book does not teach specifically—must add Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part) Unit 9: Ionic Bonding, Covalent Bonding, Metallic Bonding & Crystal Structure Chapter/Sections 10.3, 15, 16.1 & 16.2		
C4.8g	Predict oxidation states and bonding capacity for main group elements using their electron structure.	Chapter 6.3(oxidation states only) & 15.1 (connects oxidation state to electron configuration)		
C4.8h	Describe the shape and orientation of *s* and *p* orbitals.	Chapter 13.1 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C4.8i	Describe the fact that the electron location cannot be exactly determined at any given time.	Chapter 13.3 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C4.9	**Periodic Table** In the periodic table, elements are arranged in order of increasing number of protons (called the atomic number). Vertical groups in the periodic table (families) have similar physical and chemical properties due to the same outer electron structures.			
C4.9A	Identify elements with similar chemical and physical properties using the periodic table.	Chapters 2, 5, 14.1 & 14.2 Unit 3: Atomic Structure, Nuclear Reactions & Periocity		

HSCE		Activities	Resources/Materials	Assessment
		Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C4.9x	**Electron Energy Levels** The rows in the periodic table represent the main electron energy levels of the atom. Within each main energy level are sublevels that represent an orbital shape and orientation.			
C4.9b	Identify metals, non-metals, and metalloids using the periodic table.	Chapters 2, 5 & 14.1 Unit 1: Introduction, Significant Figures & Element Names Chapters 1 - 3		
C4.9c	Predict general trends in atomic radius, first ionization energy, and electonegativity of the elements using the periodic table.	Chapter 14.2 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C4.10	**Neutral Atoms, Ions, and Isotopes** A neutral atom of any element will contain the same number of protons and electrons. Ions are charged particles with an unequal number of protons and electrons. Isotopes are atoms of the same element with different numbers of neutrons and essentially the same chemical and physical properties.	Chapter 28		
C4.10A	List the number of protons, neutrons, and electrons for any given ion or isotope.	Chapter 5.3, 6.1 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C4.10B	Recognize that an element always contains the same number of protons.	Chapter 5.3 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		

HSCE		Activities	Resources/Materials	Assessment
C4.10x	**Average Atomic Mass** The atomic mass listed on the periodic table is an average mass for all the different isotopes that exist, taking into account the percent and mass of each different isotope.			
C4.10c	Calculate the average atomic mass of an element given the percent abundance and mass of the individual isotopes.	Chapter 5.3 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C4.10d	Predict which isotope will have the greatest abundance given the possible isotopes for an element and the average atomic mass in the periodic table.	Chapter 5.3 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		
C4.10e	Write the symbol for an isotope, $X\,Z\,A$, where Z is the atomic number, A is the mass number, and X is the symbol for the element.	Chapter 5.3 Unit 3: Atomic Structure, Nuclear Reactions & Periocity Chapter/Sections 5, 28.1, 28.2, 13, 14 (part) & 24 (part)		

HSCE		Activities	Resources/Materials	Assessment
P5.p1	**Conservation of Matter** *(prerequisite)* Changes of state are explained by a model of matter composed of tiny particles that are in motion. When substances undergo changes of state, neither atoms nor molecules themselves are changed in structure. Mass is conserved when substances undergo changes of state. *(prerequisite)*			
P5.p1A	Draw a picture of the particles of an element or compound as a solid, liquid, and gas. *(prerequisite)*			
C5.r1x	**Rates of Reactions** *(recommended)* The rate of a chemical reaction will depend upon (1) concentration of reacting species, (2) temperature of reaction, (3) pressure if reactants are gases, and (4) nature of the reactants. A model of matter composed of tiny particles that are in constant motion is used to explain rates of chemical reactions. *(recommended)*			
C5.r1a	Predict how the rate of a chemical reaction will be influenced by changes in concentration, temperature, and pressure. *(recommended)*	Chapter 19.1 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C5.r1b	Explain how the rate of a reaction will depend on concentration, temperature, pressure, and nature of reactant. *(recommended)*	Chapter 19.1 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C5.2	**Chemical Changes** Chemical changes can occur when two substances, elements, or compounds interact and produce one or more different substances whose physical and chemical properties are different from the interacting substances. When substances undergo chemical change, the number of atoms in the reactants is the same as the number of atoms in the products. This can be shown through simple balancing of chemical equations. Mass is conserved when substances			

HSCE		Activities	Resources/Materials	Assessment
	undergo chemical change. The total mass of the interacting substances (reactants) is the same as the total mass of the substances produced (products).			
C5.2A	Balance simple chemical equations applying the conservation of matter.	Chapter 2.4 & 8.1 Unit 5: Chemical Reactions Chapter 8		
C5.2B	Distinguish between chemical and physical changes in terms of the properties of the reactants and products.	Chapter 2 & 8.1 Unit 1: Introduction, Significant Figures & Element Names Chapters 1 – 3 Unit 5: Chemical Reactions Chapter 8		
C5.2C	Draw pictures to distinguish the relationships between atoms in physical and chemical changes.	Chapters 2 & 8.1 Unit 1: Introduction, Significant Figures & Element Names Chapters 1 – 3 Unit 5: Chemical Reactions Chapter 8		
C5.2x	**Balancing Equations** A balanced chemical equation will allow one to predict the amount of product formed.	Unit 6: Stoichiometry Chapter 9		
C5.2d	Calculate the mass of a particular compound formed from the masses of starting materials.	Chapter 9.2 Unit 6: Stoichiometry Chapter 9		
C5.2e	Identify the limiting reagent when given the masses of more than one reactant.	Chapter 9.3 Unit 6: Stoichiometry Chapter 9		
C5.2f	Predict volumes of product gases using initial volumes of gases at the same temperature and pressure.	Chapter 9.2 Unit 6: Stoichiometry Chapter 9		
C5.2g	Calculate the number of atoms present in a given mass of element.	Chapter 7.2 Unit 2: Dimensional Analysis, Unit		

HSCE		Activities	Resources/Materials	Assessment
		Conversions and the Mole Chapters 4 & 7		
C5.3x	**Equilibrium** Most chemical reactions reach a state of dynamic equilibrium where the rates of the forward and reverse reactions are equal.	Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C5.3a	Describe equilibrium shifts in a chemical system caused by changing conditions (Le Chatelier's Principle).	Chapter 19.2 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C5.3b	Predict shifts in a chemical system caused by changing conditions (Le Chatelier's Principle).	Chapter 19.2 Unit 11: Chemical Equilibrium & Kinetics Chapter 19		
C5.3c	Predict the extent reactants are converted to products using the value of the equilibrium constant.	Chapter 19.2 Unit 11: Chemical Equilibrium & Kinetics Chapter 19 Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C5.4	**Phase Change/Diagrams** Changes of state require a transfer of energy. Water has unusually high-energy changes associated with its changes of state.	Chapter 11 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		
C5.4A	Compare the energy required to raise the temperature of one gram of aluminum and one gram of water the same number of degrees.	Chapter 11.1 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		
C5.4B	Measure, plot, and interpret the graph of the temperature versus time of an ice-water mixture, under slow heating, through melting and boiling.	Chapter 11.3 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		

HSCE		Activities	Resources/Materials	Assessment
C5.4x	**Changes of State** All changes of state require energy. Changes in state that require energy involve breaking forces holding the particles together. The amount of energy will depend on the type of forces.	Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		
C5.4c	Explain why both the melting point and boiling points for water are significantly higher than other small molecules of comparable mass (e.g., ammonia and methane).	Chapter 16.3, 17.1, 17.2 Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		
C5.4d	Explain why freezing is an exothermic change of state.	Chapter 11.3 Unit 7: Thermochemistry and Calorimetry Chapter/Sections 10.4 & 11		
C5.4e	Compare the melting point of covalent compounds based on the strength of IMFs (intermolecular forces).	Chapter 16.3 Unit 10: Liquids, Water, Intermolecular Forces, Solutions Chapter/Sections 10.2, 16.3, 17 & 18		
C5.5	**Chemical Bonds — Trends** An atom's electron configuration, particularly of the outermost electrons, determines how the atom can interact with other atoms. The interactions between atoms that hold them together in molecules or between oppositely charged ions are called chemical bonds.			
C5.5A	Predict if the bonding between two atoms of different elements will be primarily ionic or covalent.	Chapter 6.1 Unit 9: Ionic Bonding, Covalent Bonding, Metallic Bonding & Crystal Structure Chapter/Sections 10.3, 15, 16.1 & 16.2		
C5.5B	Predict the formula for binary compounds of main group elements.	Chapter 6.3-6.4 Unit 9: Ionic Bonding, Covalent Bonding, Metallic Bonding &		

HSCE		Activities	Resources/Materials	Assessment
		Crystal Structure Chapter/Sections 10.3, 15, 16.1 & 16.2		
C5.5x	**Chemical Bonds** Chemical bonds can be classified as ionic, covalent, and metallic. The properties of a compound depend on the types of bonds holding the atoms together.	Chapter 15-16 (omit 16.2)		
C5.5c		Chapters 15 & 16.1 Unit 9: Ionic Bonding, Covalent Bonding, Metallic Bonding & Crystal Structure Chapter/Sections 10.3, 15, 16.1 & 16.2		
C5.5d	Compare the relative melting point, electrical and thermal conductivity, and hardness for ionic, metallic, and covalent compounds.	Chapters 10, 15.2, 15.3 & 16 Unit 9: Ionic Bonding, Covalent Bonding, Metallic Bonding & Crystal Structure Chapter/Sections 10.3, 15, 16.1 & 16.2		
C5.5e	Relate the melting point, hardness, and electrical and thermal conductivity of a substance to its structure.	Chapters 10, 15.2, 15.3 & 16 Unit 9: Ionic Bonding, Covalent Bonding, Metallic Bonding & Crystal Structure Chapter/Sections 10.3, 15, 16.1 & 16.2		
C5.6x	Reduction/Oxidation Reactions Chemical reactions are classified according to the fundamental molecular or submolecular changes that occur. Reactions that involve electron transfer are known as oxidation/ reduction (or "redox").	Chapter 22-23		
C5.6a	Balance half-reactions and describe them as oxidations or reductions.	Chapter 22.1, 22.3 Unit 14: Oxidation, Reduction and Electrochemistry Chapters 22.1, 22.2, 22.3,		

HSCE		Activities	Resources/Materials	Assessment
		23.1,23.2, 23.3		
C5.6b	Predict single replacement reactions.	Chapter 8.2, 23.1 Unit 5: Chemical Reactions Chapter 8 Unit 14: Oxidation, Reduction and Electrochemistry Chapters 22.1, 22.2, 22.3, 23.1,23.2, 23.3		
C5.6c	Explain oxidation occurring when two different metals are in contact.	Chapter 22.1, 23.1 Unit 14: Oxidation, Reduction and Electrochemistry Chapters 22.1, 22.2, 22.3, 23.1,23.2, 23.3		
C5.6d	Calculate the voltage for spontaneous redox reactions from the standard reduction potentials.	Chapter 23.2 Unit 14: Oxidation, Reduction and Electrochemistry Chapters 22.1, 22.2, 22.3, 23.1,23.2, 23.3		
C5.6e	Identify the reactions occurring at the anode and cathode in an electrochemical cell.	Chapter 23.1, 23.3 Unit 14: Oxidation, Reduction and Electrochemistry Chapters 22.1, 22.2, 22.3, 23.1,23.2, 23.3		
C5.7	**Acids and Bases** Acids and bases are important classes of chemicals that are recognized by easily observed properties in the laboratory. Acids and bases will neutralize each other. Acid formulas usually begin with hydrogen, and base formulas are a metal with a hydroxide ion. As the pH decreases, a solution becomes more acidic. A difference of one pH unit is a factor of 10 in hydrogen ion concentration.	Chapter 20-21		
C5.7A	Recognize formulas for common inorganic acids, carboxylic acids, and bases formed from	Chapters 6.5, 20 & 26.3 Unit 12: Acids, Bases, pH and		

HSCE		Activities	Resources/Materials	Assessment
	families I and II.	Neutralization Reactions Chapters 20 & 21 Unit 13: Select Organic Functional Groups & Polymer Chapter/Sections 25.1, 25.3 & 26.4		
C5.7B	Predict products of an acid-based neutralization.	Chapter 21.1 Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C5.7C	Describe tests that can be used to distinguish an acid from a base.	Chapter 20.2 Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C5.7D	Classify various solutions as acidic or basic, given their pH.	Chapter 20.2 Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C5.7E	Explain why lakes with limestone or calcium carbonate experience less adverse effects from acid rain than lakes with granite beds.	Chapter 21.2 Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C5.7x	**Brønsted-Lowry** Chemical reactions are classified according to the fundamental molecular or submolecular changes that occur. Reactions that involve proton transfer are known as acid/base reactions.	Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C5.7f	Write balanced chemical equations for reactions between acids and bases and perform calculations with balanced equations.	Chapter 21.1 Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C5.7g	Calculate the pH from the hydronium ion or hydroxide ion concentration.	Chapter 20.2 Unit 12: Acids, Bases, pH and Neutralization Reactions		

HSCE		Activities	Resources/Materials	Assessment
		Chapters 20 & 21		
C5.7h	Explain why sulfur oxides and nitrogen oxides contribute to acid rain.	Chapter 20, pg. 607 Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C5.r7i	Identify the Brønsted-Lowry conjugate acid-base pairs in an equation. *(recommended)*	Chapter 20.3 Unit 12: Acids, Bases, pH and Neutralization Reactions Chapters 20 & 21		
C5.8	**Carbon Chemistry** The chemistry of carbon is important. Carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures, including synthetic polymers, oils, and the large molecules essential to life.			
C5.8A	Draw structural formulas for up to ten carbon chains of simple hydrocarbons.	Chapter 25.1 Unit 13: Select Organic Functional Groups & Polymer Chapter/Sections 25.1, 25.3 & 26.4		
C5.8B	Draw isomers for simple hydrocarbons.	Chapter 25.3 Unit 13: Select Organic Functional Groups & Polymer Chapter/Sections 25.1, 25.3 & 26.4		
C5.8C	Recognize that proteins, starches, and other large biological molecules are polymers.	Chapter 26.4 Unit 13: Select Organic Functional Groups & Polymer Chapter/Sections 25.1, 25.3 & 26.4		

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