Chemistry Correlation Guide
2016 Science Indiana Academic Standards to 2022 Performance Expectations*

2016 Indiana Academic Standard	2022 Performance Expectation
C.1.1 Differentiate between pure substances and mixtures based on physical and chemical properties. **C.1.2** Use chemical properties, extensive, and intensive physical properties to identify substances. **C.2.2** Determine the number of protons, neutrons, and electrons in isotopes and calculate the average atomic mass from isotopic abundance data. **C.2.3** Write the full and noble gas electron configuration of an element, determine its valence electrons, and relate this to its position on the periodic table. **C.2.4** Use the periodic table as a model to predict the relative properties of elements based on the pattern of valence electrons and periodic trends.	**HS-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.
C.1.3 Recognize observable macroscopic indicators of chemical changes. **C.1.4** Describe physical and chemical changes at the particle level. **C.1.6** Demonstrate an understanding of the law of conservation of mass through the use of particle diagrams and mathematical models.	**HS-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.
C.3.5 Use laboratory observations and data to compare and contrast ionic, covalent, network, metallic, polar, and non-polar substances with respect to constituent particles, strength of bonds, melting and boiling points, and conductivity; provide examples of each type.	**HS-PS1-3.** Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
C.6.3 Classify chemical reactions and phase changes as exothermic or endothermic based	**HS-PS1-4.** Develop a model to illustrate that the release or absorption of energy from a

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on enthalpy values. Use a graphical representation to illustrate the energy changes involved.	chemical reaction system depends upon the changes in total bond energy.
	HS-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.
C.4.5 Use a balanced chemical equation to calculate the quantities of reactants needed and products made in a chemical reaction that goes to completion.	**HS-PS1-6.** Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
C.4.3 Balance chemical equations and use the law of conservation. **C.4.4** Apply the mole concept to determine the mass, moles, number of particles, or volume of a gas at STP, in any given sample, for an element or compound. **C.4.5** Use a balanced chemical equation to calculate the quantities of reactants needed and products made in a chemical reaction that goes to completion. **C.4.6** Perform calculations to determine the composition of a compound or mixture when given the necessary information.	**HS-PS1-7.** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
C.2.5 Compare and contrast nuclear reactions with chemical reactions. **C.2.6** Describe nuclear changes in matter, including fission, fusion, transmutations, and decays. **C.2.7** Perform half-life calculations when given the appropriate information about the isotope.	**HS-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.
C.7.1 Describe the composition and properties of solutions. **C.7.2** Explain how temperature, pressure,	**HS-PS1-9.** Use mathematical representations to describe the composition and properties of individual solutions and solutions involved in chemical reactions.

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and polarity of the solvent affect the solubility of a solute. **C.7.3** Describe the concentration of solutes in a solution in terms of molarity. Perform calculations using molarity, mass, and volume. Prepare a sample of given molarity provided a known solute. **C.8.1** Classify solutions as acids or bases and describe their characteristic properties. **C.8.2** Compare and contrast the strength of acids and bases in solutions. **C.8.3** Given the hydronium ion and/or the hydroxide ion concentration, calculate the pH and/or the pOH of a solution. Explain the meanings of these values.	
C.5.1 Use the kinetic molecular theory with the combined and ideal gas laws to explain changes in volume, pressure, moles, and temperature of a gas. **C.5.1** Use the kinetic molecular theory with the combined and ideal gas laws to explain changes in volume, pressure, moles, and temperature of a gas.	**HS-PS1-10**. Analyze data to support the claim that the combined gas law describes the relationships among volume, pressure and temperature for a sample of an ideal gas.
	HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
	HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).
C.6.1 Explain that atoms and molecules are in constant motion and that this motion increases as thermal energy increases.	**HS-PS3-3.** Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a

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C.6.2 Distinguish between the concepts of temperature and heat flow in macroscopic and microscopic terms. **C.6.3** Classify chemical reactions and phase changes as exothermic or endothermic based on enthalpy values. Use a graphical representation to illustrate the energy changes involved. **C.6.4** Perform calculations involving heat flow, temperature changes, and phase changes by using known values of specific heat, phase change constants, or both.	closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

*Performance expectations are three dimensional. All three dimensions (Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts) must be included as part of effective instruction.

For more information, see the Indiana Department of Education’s Indiana Academic Standards webpage or contact the Office of Teaching and Learning.