Chemistry NGSS - 2016 IAS Correlation Guide

NGSS	Indiana's Academic Standards 2016 Chemistry
	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.1.3 Recognize observable macroscopic indicators of chemical changes.
	C.1.4 Describe physical and chemical changes at the particle level.
	C.1.5 Describe the characteristics of solids, liquids, and gases and changes in state at the macroscopic and microscopic levels.
	C.1.6 Demonstrate an understanding of the law of conservation of mass through the use of particle diagrams and mathematical models.
	C.1.7 Perform calculations involving density and distinguish among materials based on densities.
	C.2.1 Using available experimental data, explain how and why models of atomic structure have changed over time.
	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.

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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.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.
	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.
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.2.7** Perform half-life calculations when given the appropriate information about the isotope.
	C.3.1 Investigate the observable characteristics of elements, ionic, and covalent compounds.
	C.3.2 Compare and contrast how ionic and covalent compounds form.
	C.3.3 Draw structural formulas for simple molecules and determine their molecular shape.
	C.3.4 Write chemical formulas for ionic compounds and covalent compounds given their names and vice versa.
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.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.

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	C.3.6 Use structural formulas of hydrocarbons to illustrate carbon's ability to form single and multiple bonds within a molecule.
	C.4.1 Describe, classify and give examples of various kinds of reactions: synthesis (i.e., combination), decomposition, single displacement, double displacement, acid/base, and combustion.
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.4.2** Predict products of simple reactions as listed in C.4.1.
HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	**C.4.3** Balance chemical equations and use the law of conservation of mass to explain why this must be true.
	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.
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.4.5** 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.
	C.4.7 Apply lab data to determine the empirical and molecular formula of a compound.

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	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.5.2 Apply the ideal gas equation (PV = nRT) to calculate the change in one variable when another variable is changed and the others are held constant.
	C.5.3 Use lab data and a balanced chemical equation to calculate volume of a gas at STP and non STP conditions, assuming that the reaction goes to completion and the ideal gas law holds.
	C.6.1 Explain that atoms and molecules are in constant motion and that this motion increases as thermal energy increases.
	C.6.2 Distinguish between the concepts of temperature and heat flow in macroscopic and microscopic terms.
HS-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.	**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.
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	**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.
	C.7.1 Describe the composition and properties of solutions.
	C.7.2 Explain how temperature, pressure, 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.

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	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.