NORTH CAROLINA STANDARD COURSE OF STUDY
Crosswalk
Chemistry

The purpose of this document is to provide a general comparison of the 2009 Standard Course of Study and the 2023 Chemistry Standard Course of Study. It provides initial insight into similarities and differences between these two sets of standards. This document is not intended to answer all questions about the nuances of the new 2023 standards versus the previous 2009 standards..

Chemistry Standards

Note: The 2023 Chemistry standards and objectives are not intended to be the curriculum, nor do they indicate the whole of a curriculum which will be written by a local public-school unit (PSU) or school. The standards for this course have been developed to serve as the framework which will guide each PSU in the development of the curriculum for Chemistry.

Matter and Its Interactions		
2023 Standards/Objectives	**2009 Essential Standards/Clarifying Objectives**	Notes
PS.Chm.1 Analyze the structure of atoms and isotopes.	*Chm.1.1 Analyze the structure of atoms and ions.*	
PS.Chm.1.1 Use models to explain how the scientific understanding of atomic structure has evolved.	Chm.1.1.1 Analyze the structure of atoms, isotopes, and ions.	
PS.Chm.1.2 Use models to compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission.	Chm.1.1.4 Explain the process of radioactive decay by the use of nuclear equations and half-life.	
PS.Chm.1.3 Use models to explain how electrons are distributed in atoms.	Chm.1.1.2 Analyze an atom in terms of the location of electrons. Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model.	

PS.Chm.2 Understand the physical and chemical properties of atoms based on their position in the Periodic Table.	*Chm.1.3 Understand the physical and chemical properties of atoms based on their position in the Periodic Table.*	
PS.Chm.2.1 Use the Periodic Table as a model to predict the relative properties of elements based on the pattern of valence electrons in the outermost energy levels of atoms.	Chm.1.3.1 Classify the components of a periodic table (period, group, metal, metalloid, nonmetal, transition).	
	Chm.1.3.2 Infer the physical properties (atomic radius, metallic and nonmetallic characteristics) of an element based on its position on the Periodic Table.	
PS.Chm.2.2 Construct an explanation to infer the atomic size, reactivity, electronegativity, and ionization energy of an element based on its position in the Periodic Table.	Chm.1.3.3 Infer the atomic size, reactivity, electronegativity, and ionization energy of an element from its position in the Periodic Table.	
PS.Chm.3 Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties.	*Chm.1.2 Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties.*	
PS.Chm.3.1 Analyze and interpret data to explain the mechanisms and properties of the two main types of intramolecular (ionic and covalent) bonds.	Chm.1.2.1 Compare (qualitatively) the relative strengths of ionic, covalent, and metallic bonds.	
PS.Chm.3.2 Construct an explanation to summarize the influences intermolecular forces have on the properties of chemical compounds.	Chm.1.2.3 Compare inter- and intra- particle forces.	
	Chm.1.2.5 Compare the properties of ionic, covalent, metallic, and network compounds.	
PS.Chm.3.3 Use models to predict chemical names and formulas including ionic (binary & ternary), acidic, and binary covalent compounds.	Chm.1.2.2 Infer the type of bond and chemical formula formed between atoms.	
	Chm.1.2.4 Interpret the name and formula of compounds using IUPAC convention.	
PS.Chm.4 Analyze chemical reactions in terms of quantities, product formation, and energy.	*Chm.2.2 Analyze chemical reactions in terms of quantities, product formation, and energy.*	
PS.Chm.4.1 Use models to explain the exothermic or endothermic nature of chemical changes.	Chm.2.2.1 Explain the energy content of a chemical reaction.	

PS.Chm.4.2 Carry out investigations to predict the outcome of simple chemical reactions that obey the Law of Conservation of Mass.	Chm.2.2.2 Analyze the evidence of chemical change.	
	Chm.2.2.3 Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion).	
PS.Chm.4.3 Use mathematics and computational thinking to analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and mole conversions).	Chm.2.2.5 Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and hydrates).	
PS.Chm.4.4 Use mathematics and computational thinking to apply the mole concept in the stoichiometric relationships inherent in chemical reactions.	Chm.2.2.4 Analyze the stoichiometric relationships inherent in a chemical reaction.	
PS.Chm.5 Understand the factors affecting rate of reaction and chemical equilibrium.	*Chm.3.1 Understand the factors affecting rate of reaction and chemical equilibrium.*	
PS.Chm.5.1 Carry out investigations to explain the effects of temperature, surface area, stirring, the concentration of reactants, and the presence of catalysts on the rate of chemical reactions according to Collision Theory.	Chm.3.1.1 Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst).	
PS.Chm.5.2 Analyze and interpret data to predict how stressors on a reaction (concentration, temperature, pressure) would shift equilibrium.	Chm.3.1.2 Explain the conditions of a system at equilibrium.	
	Chm.3.1.3 Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle).	

PS.Chm.6 Understand solutions and the solution process.	*Chm.3.2 Understand solutions and the solution process.*	
PS.Chm.6.1 Carry out investigations to summarize the factors that affect the formation and properties of solutions.	Chm.3.2.4 Summarize the properties of solutions.	
	Chm.3.2.5 Interpret solubility diagrams.	
	Chm.3.2.6 Explain the solution process.	
PS.Chm.6.2 Use models to explain the quantitative nature of a solution (molarity, dilution, titration).	Chm.3.2.3 Infer the quantitative nature of a solution (molarity, dilution, and titration with a 1:1 molar ratio).	
PS.Chm.6.3 Carry out investigations to compare properties and behaviors (qualitative and quantitative) of acids and bases.	Chm.3.2.1 Classify substances using the hydronium and hydroxide ion concentrations.	
	Chm.3.2.2 Summarize the properties of acids and bases.	

Energy		
2023 Standards/Objectives	**2009 Essential Standards/Clarifying Objectives**	Notes
PS.Chm.7 Understand the relationship among pressure, temperature, volume, and phase.	Chm.2.1 Understand the relationship among pressure, temperature, volume, and phase.	
PS.Chm.7.1 Use models to explain how changes in energy affect the arrangement and movement of the particles in solids, liquids, and gases, as well as the relative strengths of their intermolecular forces.	Chm.2.1.1 Explain the energetic nature of phase changes.	
	Chm.2.1.2 Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point).	
	Chm.2.1.3 Interpret the data presented in phase diagrams.	

PS.Chm.7.2 Use mathematics and computational thinking to execute simple calorimetric calculations based on the Law of Conservation of Energy.	Chm.2.1.4 Infer simple calorimetric calculations based on the concepts of heat lost equals heat gained and specific heat.	
PS.Chm.7.3 Use mathematics and computational thinking to explain the relationships among pressure, temperature, volume, and quantity of gas, both qualitatively and quantitatively.	Chm.2.1.5 Explain the relationships between pressure, temperature, volume, and quantity of gas both qualitative and quantitative.	