North Carolina Science

Chemistry

Matter and its Interactions

1 **Analyze the structure of atoms and isotopes.** PS.CHM.1

1 Use models to explain how the scientific understanding of atomic structure has evolved. PS.CHM.1.1

2 Use models to compare nuclear reactions including alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission. PS.CHM.1.2

3 Use models to explain how electrons are distributed in atoms. PS.CHM.1.3

2 **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. PS.CHM.2.1

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. PS.CHM.2.2

3 **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. PS.CHM.3.1

2 Construct an explanation to summarize the influences intermolecular forces have on the properties of chemical compounds. PS.CHM.3.2

3 Use models to predict chemical names and formulas including ionic (binary & ternary), acidic, and binary covalent compounds. PS.CHM.3.3

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4 **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. PS.CHM.4.1

2 Carry out investigations to predict the outcome of simple chemical reactions that obey the Law of Conservation of Mass. PS.CHM.4.2

3 Use mathematics and computational thinking to analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and mole conversions). PS.CHM.4.3

4 Use mathematics and computational thinking to apply the mole concept in the stoichiometric relationships inherent in chemical reactions. PS.CHM.4.4

5 **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. PS.CHM.5.1

2 Analyze and interpret data to predict how stressors on a reaction (concentration, temperature, pressure) would shift equilibrium. PS.CHM.5.2

6 **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. PS.CHM.6.1

2 Use models to explain the quantitative nature of a solution (molarity, dilution, titration). PS.CHM.6.2

3 Carry out investigations to compare properties and behaviors (qualitative and quantitative) of acids and bases. PS.CHM.6.3

Energy

7 **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. PS.CHM.7.1

2 Use mathematics and computational thinking to execute simple calorimetric calculations based on the Law of Conservation of Energy. PS.CHM.7.2

3 Use mathematics and computational thinking to explain the relationships among pressure, temperature, volume, and quantity of gas, both qualitatively and quantitatively. PS.CHM.7.3