Advanced Topics in Chemistry Scope & Sequence

Days	Unit	Standard(s)/Outcome(s)	Essential/Guiding Questions
8	**Lab Safety & Chemistry I Review** • Lab safety • Atomic structure • Electron configuration • Reading the periodic table • Chemical bonds: ionic and covalent • Types of chemical formulas • Types of chemical reactions • Writing and balancing chemical equations	*This unit is a precursor to all units. Although it does not have any direct NGSS performance expectations it builds a foundation for all future units.* **HS-PS1** **HS-PS1-1** **HS-PS1-2**	***How does matter interact?***
13	**Stoichiometry** • Mole Conversion • Molar Mass • Mass • Volume • Particles • 3-step stoichiometry conversions • Limiting reactants	**HS-PS1-2** **HS-PS1-7** **HS-PS2-2**	***How do substances quantitatively combine/change/react to make new substances?***

	• % yield • Hydrates • Empirical formula • Molarity • Molality		
12	**Kinetic Molecular Theory and Gas Laws** • Kinetic Molecular Theory • Temperature and Pressure conversions • Boyle's Law • Charles Law • Gay-Lussac's Law • Combined Gas Law • Ideal Gas Law • Dalton's Law • Graham's Law	**HS-PS1-7**	***How can one explain the structure, properties and interactions of matter?***
7	**Thermodynamics** • Enthalpy • Exothermic • Endothermic • Hess' Law • Heat of formation • Specific heat • Entropy • Free energy	**HS-PS1-4** **HS-PS2-2** **HS-PS3-1** **HS-PS3-2** **HS-PS3-4**	***How is energy transferred and conserved?***

10	**Kinetics** ● Collision theory ● Rates of reaction ● Rate laws ● Mechanisms ● Energy diagrams	**HS-PS1-5** **HS-PS2-6**	***What underlying forces explain the variety of interactions observed?***
8	**Equilibrium** ● Definition of equilibrium ● Equilibrium constant expressions ● Le Chatelier's Principle	**HS-PS1-6** **HS-PS1-7**	***How can one predict the changes needed to increase products in a chemical reaction?***
10	**Redox** ● Defining oxidation and reduction ● Assigning oxidation numbers ● Half reactions ● Balancing simple redox reactions ● Corrosion ● Electrochemistry	**HS-PS1** **HS-PS1-3**	***What is the mechanism and driving force behind oxidation reduction reactions?***
12	**Acids & Bases** ● Properties ● Naming ● Definitions ● Conjugate acid-base pairs	**HS-PS1-2** **HS-PS1-7** **HS-PS2-6**	***How can pH be used to predict and explain chemical interactions?***

	• Calculating pH, $[H^+]$ • Titrations • Titration curves • Buffers		