HCPS Chemistry Course

Unit & Title	MSDE/NGSS Science Standards	Lesson Topic	
Unit 1 – Atomic Structure and the Periodic Table *22 Class Periods*	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. 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. HS-PS4-4: Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. HS-ESS1-1: Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy in the form of radiation. HS-ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements. HS-ESS1-5: Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics	Experience 1	Atomic Structure
		Experience 2	Changes in the Nucleus
		Experience 3	Flame Test
		Experience 4	Electron Configurations

	to explain the ages of crustal rocks. HS-ESS1-6: Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.	Experience 5	Periodic Trends

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Unit 2 – Chemical Bonding *21 Class Periods*	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. 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.	Experience 1	Bonding and Geometries of Compounds

	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. HS-PS2-6: Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. HS-ESS3-2: Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.	Experience 2	Properties of Ionic and Covalent
		Experience 3	Evaporation of Liquids
		Experience 4	Research on the Molecular Structure of a Material

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Unit 3 – Chemical Reactions and Stoichiometry *14 Class Periods*	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. 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. HS-PS1-7: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.	Experience 1	Balancing Equations
		Experience 2	Types of Reactions
		Experience 3	Moles
		Experience 4	Composition Stoichiometry
		Experience 5	Stoichiometry

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Unit 4 – Thermochemistry *15 Class Periods*	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. 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). HS-PS3-4: Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.	Experience 1	Endothermic Versus Exothermic
		Experience 2	Bond Energies
		Experience 3	Calorimetry and Enthalpy Changes
		Experience 4	Calorimetry and Enthalpy of Solutions
		Experience 5	Changes of State Thermochemistry
		Experience 6	Energy Changes

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Unit 5 – Kinetics and Equilibrium *7 Class Periods*	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. 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. HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.	Experience 1	Factors Affecting Reaction Rates
		Experience 2	Rates and Rate Laws
		Experience 3	Chemical Equilibrium and Le Chatelier's Principle