New Paltz Central School District
Chemistry

Time	Essential Questions/Content	Skills	Assessments
September – October	**<u>Unit 1: Matter and Energy</u>** • What is chemistry?	• Use a simple particle model to differentiate between properties of a solid, a liquid, and a gas. • Use diagrams or models to differentiate elements, compounds, mixtures. • Distinguish between heat energy and temperature in terms of molecular motion and amount of matter. • Explain phase changes in terms of the changes in energy and intermolecular distance. • Convert temperatures in Celsius degrees to kelvins, and kelvins to Celsius degrees. • Explain gas laws in terms of KMT and solve problems, using the combined gas law. • Quantitively interpret heating and cooling curves in terms of changes in kinetic and potential energy, heat of vaporization, heat of fusion, and phase changes. • Calculate the heat involved in a phase or temperature change for a given substance. • Distinguish between endothermic and exothermic reactions, using the energy term in a reaction, delta H value, potential energy diagram or experimental data. • Explain vapor pressure, evaporation rate, and phase change in terms of intermolecular forces. • Compare the physical properties of substances based upon chemical bond and intermolecular forces.	

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November	**<u>Unit 2: Atomic Structure</u>**	• Use models to describe the structure of an atom. • Relate experimental evidence given in the introduction to models of the atom. • Calculate the mass number of an atom, the number of neutrons or the number of protons, given the other two values. • Distinguish between ground state and excited state electron configurations, e.g., 2-8-2 vs. 2-7-3. • Identify an element by comparing its bright-line spectrum to given spectra. • Draw a Lewis electron-dot structure of an atom. Identify non-valence and valence electrons, given an electron configuration, e.g., 2-8-2. • Given an atomic mass, determine the most abundant isotope. Calculate the atomic mass of an element, given the masses and ratios of the naturally occurring isotopes.	
December	**<u>Unit 3: The Periodic Table</u>**	• Interpret and write symbols of isotopes • Classify elements as metals, nonmetals, metalloids, or noble gases, by their properties • Describe the states of the elements at STP. Describe the ions of some transition elements as having color • Explain the placement of an unknown element in the Periodic Table based on its properties • Determine the group of an element, given the chemical formula of a compound, e.g., XCL or XCl_2 • Compare and contrast properties of elements within a group or period for Groups 1, 2, 13-18 on the Periodic Table	• Midterm exam

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January	**<u>Unit 4: Chemical Bonding</u>**	• Demonstrate bonding concepts using Lewis dot structures representing valence electrons: transferred, or ionic bonding; shared, or covalent bonding • Distinguish between nonpolar covalent bonds (two of the same non metals) and polar covalent bonds	
February	**<u>Unit 5: Moles/Stoichimetry</u>**	• Distinguish among ionic, covalent, and metallic substances, given their properties • Determine the molecular formula, given the empirical formula and molecular maps • Determine the empirical formula from a molecular formula • Calculate the formula mass and the gram-formula mass • Determine the number of moles of a substance, given its mass • Determine the mass of a given number of moles of a substance • Balance equations, given the formulas for reactants and products • Interpret balanced equations in terms of conservation of matter and energy • Create and use models of particles to demonstrate balanced equations • Calculate simple mole-mole problems, given a balanced equation	

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February	**<u>Unit 6: Solutions</u>**	• Describe the process and use of filtration, distillation, and chromatography in the separation of a mixture • Interpret and construct solubility curves. Apply the terms saturated, unsaturated, supersaturated • Apply the adage "like dissolves like" in real-world situations • Describe the preparation of a solution, given the molarity • Interpret solution concentration data • Calculate solution concentrations in molarity, percent by mass, parts per million	
March	**<u>Unit 7: Acid and Base</u>**	• Identify substances as Arrhenius acids or bases, given properties • Write simple neutralization reactions when given the reactants • Calculate the concentration or volume of a solution, using the tiltration data • Interpret color changes in acid base indicators • Identify solutions as acid, base, or neutral based upon its pH	
April	**<u>Unit 8: Kinetics and Equilibrium</u>**	• Use collision theory to explain how various factors such as temperature, surface area and concentration influence the rate of reaction • Identify examples of physical equilibria, as solution equilibrium and phase equilibrium, including the concept that a saturated solution is at equilibrium • Describe the concentration of particles and rates of opposing reaction in an equilibrium system • Qualitatively describe the effect of stress on equilibrium, using LeChatelier's Principle	

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		• Read and interpret potential energy diagrams, PE of reactants and products, activation energy (with and without a catalyst), heat or reaction • Compare the entrophy of the phases of matter	
April - May	**<u>Unit 9: Oxidation – Reduction</u>**	• Determine a missing reactant or product in a balanced equation • Write and balance half-reactions for oxidation and reduction for free elements and their monatomic ions • Identify and label the parts of a voltaic cell (cathode, anode, and salt bridge, and direction of electron flow) given the reaction equation • Compare and contrast voltaic and electrolytic cells. Determine the case of reduction or oxidation; determine what combination of metals and ions will react. Determine which metal will replace another. • Identify and label the parts of an electrolytic cell (anode, cathode, and direction of electron flow), given the reaction equation. • Compare and contrast the processes in voltaic and electrolytic cells	

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10 week course	**<u>Organic Chemistry</u>**	• Draw structural formulas for alkanes, alkenes, and alkynes, containing a maximum of ten carbon atoms. • Draw a structural formula with the functional group(s) on a straight chain hydrocarbon backbone, when given the correct IUPAC name for the compound. • Classify an organic compound based on its structural or condensed structural formula. • Identify organic reactions. Determine a missing reactant or product in a balanced equation.	
	<u>Nuclear Chemistry</u>	• Calculate the initial amount, the fraction remaining, or the half-life of a radioactive isotope, given two of the three variables. • Determine decay mode and write nuclear equations showing alpha and beta decay. • Compare and contrast fission and fusion reactions. • Complete nuclear equations. Predict missing particles from nuclear equations. • Identify specific uses of some common radioisotopes, such as I-131 (diagnosing and treating thyroid disorders), C-14/C-12 ratio (dating living organisms), U-238/Pb-206 (dating geologic formations), Co-60 (treating cancer), P-32 (plant research).	