Chemistry: Chemical Reactions

Stage 1 Desired Results

ESTABLISHED GOALS:

Competencies:

- **Patterns:** Students will demonstrate the ability to observe and describe patterns in natural and human designed phenomena and use those patterns to support claims about the observed or predicted relationships among phenomena.
- **Scale, Proportion, & Quantity:** Students will demonstrate the ability to describe and represent the significance of changes in observable and non-observable phenomena in terms of relative scale, proportion, and quantity.
- **Nature of Science:** Student will demonstrate the ability to work collaboratively and individually to generate testable questions or define problems, plan and conduct investigations using a variety of research methods in a various settings, analyze and interpret data, reason with evidence to construct explanations in light of existing theory and previous research, and effectively communicate the research processes and conclusions.
- ***Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials.***
- ***Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences.***
- ***Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style.***

Content Standards:

- 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-PS1-4. 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-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.

Transfer

*Students will be able to independently use their learning to **make informed decisions based upon their knowledge of chemical reactions.***

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.
- the total amount of energy and matter in a closed system is conserved.
- much of science deals with constructing explanations of how things change and how they remain stable.
- science assumes the universe is a vast single system in which basic laws are consistent.

ESSENTIAL QUESTIONS

- *How does what you change influence how it changes?*

• 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-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	***Acquisition***	
	Students will know… • that a stable molecule has less energy than the same set of atoms, separated; one must provide at least this energy in order to take the molecule apart. • that chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. • that, in many situations, a dynamic and condition dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. • that, the fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. *vocabulary:* mass, mole relationships, Avogadro's number, molar mass, representative particle, atom, molecule, formula unit, empirical formula, molecular formula, solution process, particles/ mass relationship, 6.02 x E23, quanitity of matter, type of matter, RP of elements, RP of Cov cpd, RP ofionic cpd, 22.4 L @STP, 0C, 1.00atm, simplest ratio, hydrated salt formulas, heats of reaction, single bond, double bond, triple bond, valence electrons, Lewis-dot structures, Octet rule, Structural diagrams, Polar and Nonpolar bonds, Ionic Bonds, Metallic bonding, covalent bonding, VESPR models, Orbital Hybridization sp3, Multiple bonds, electronegativity, naming system, bond angle, bond energy, delocalization, resonance, pi and sigma bonds, molecular orbitials, dipole moment, geometries:	*Students will be skilled at…* • constructing and revising explanations. • developing models. • applying scientific principles and evidence to provide an explanation. • refining the design of a system. • using mathematical representations.

	linear, trogonal planar, tetrahedral, bent, Mole, ideal gas law, molar volume 22.4 L at STP, diatomic gas, gas law relationships, quantity of matter, Universal Gas Constant "R", Pressure relationship (atm, mmHG), Temperature Conversions (C&K), solute, solvent, hydrogen bonding, strong acid, weak acid, base, buffer, titration, chemical equilribrium, phase change diagram, indicators, serial dilution, pH, LeChatelier's Principle, Ka, Kb, Kw, Elecytrolyte, titration, hydroxide, Hydronium ions, neutralization, net ionic equation,molarity, oxidation, reduction, precipitation, concentration calculations, polyprotic acids, solution equilibrium, reactants, products	
Content Area Literacy Standards		*21st Century Skills*
• RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. • RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. • RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. • RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics*. • RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. • RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. • RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. • WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. • WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. • selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. • WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.	• *use systems thinking* • *solve problems*

Stage 2 - Evidence	
Evaluative Criteria	***Assessment Evidence***
	PERFORMANCE TASK(S):
	OTHER EVIDENCE:

Stage 3 – Learning Plan	
Summary of Key Learning Events and Instruction	
Language Arts Integration	***Mathematics Integration***
•	• **HSN-Q.A.1 -** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. • **HSN-Q.A.2 -** Define appropriate quantities for the purpose of descriptive modeling. • **HSN-Q.A.3 -** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. • **MP.2 -** Reason abstractly and quantitatively. • **MP.4 -** Model with mathematics.

Technology Integration	***District Materials***
• 1.OA.1 Use	
Science and Engineering Practices	
S&EP 2. Developing and using models S&EP 5. Using mathematics and computational thinking S&EP 6. Constructing explanations (for science) and designing solutions (for engineering) S&EP 8. Obtaining, evaluating, and communicating information	