Physical Science: 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.***
- ***Structure & Function: Students will demonstrate the ability to use evidence to support claims about the relationship among structure and function of natural and human designed objects.***
- ***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. Illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy (exothermic vs Endothermic).
- 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.
- changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.
- 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

- *Can something change but still be the same?*

Acquisition

Students will know…

- that bonding creates stable molecules, therefore it takes energy to break molecules 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 (endothermic vs exothermic).
- 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.

Students will be skilled at…

- constructing and revising explanations.
- applying scientific principles and evidence.
- using mathematical representations to support claims.

• HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	*vocabulary*: ionic bond, covalent bond, hydrogen bond, endothermic, exothermic, law of conservation of mass, catalyst, inhibitor, synthesis, decomposition, single replacement, double replacement, oxidation, pH, acids, bases, indicators, neutralization, organic chemistry, hydrocarbons, carbohydrates	
Content Area Literacy Standards		***21st Century Skills***
• RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. • RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. • RST.9-10.4 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 9-10 texts and topics*. • RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*). • RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. • WHST.9-10.1 Write arguments focused on *discipline-specific content*. • WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. • WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. • WHST.9-10.7 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. • WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. • WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.	• *use systems thinking* • *work creatively with others* • *communicate clearly* • *collaborate with others*

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***
● 1.OA.1 Use	• **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 1. Asking questions and defining problems S&EP 2. Developing and using models S&EP 3. Planning and carrying out investigations S&EP 4. Analyzing and interpreting data S&EP 5. Using mathematics and computational thinking S&EP 6. Constructing explanations (for science) and designing solutions (for engineering) S&EP 7. Engaging in argument from evidence S&EP 8. Obtaining, evaluating, and communicating information	