

ChemMatters Magazine February 2020

Chemistry Concepts & Standard Alignments (NGSS, CCSS)



Correlations to Next Generation Science Standards

Article	Chemistry Concepts	NGSS Connections
<u>Chemistry Takes to the Skies</u>	<p>Chemistry basics – Chemical and Physical changes; Physical properties</p> <p>Gases – Temperature</p> <p>Quantitative Chemistry – SI units</p> <p>Solutions – Mixtures</p> <p>States of Matter – Boiling point</p>	<p>HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.</p> <p>HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.</p> <p>Disciplinary Core Ideas:</p> <ul style="list-style-type: none"> PS1.A: Structure and Properties of Matter ETS1.C: Optimizing the design solution <p>Crosscutting Concepts:</p> <ul style="list-style-type: none"> Cause and Effect: Mechanism and explanation Structure and Function <p>Science and Engineering Practices:</p> <ul style="list-style-type: none"> Developing and using models Constructing explanations (for science) and designing solutions (for engineering) <p>Nature of Science:</p> <ul style="list-style-type: none"> Scientific knowledge is based on empirical evidence. Scientific knowledge assumes an order and consistency in natural systems.
Chernobyl's Legacy	<p>Atomic Structure – Isotopes</p> <p>Nuclear Chemistry</p> <ul style="list-style-type: none"> Alpha/beta/gamma decay Half-lives Pros/cons of nuclear power Radioactive isotopes Radiation 	<p>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.</p> <p>HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.</p> <p>Disciplinary Core Ideas:</p> <ul style="list-style-type: none"> PS1.C: Nuclear Processes ETS1.C: Optimizing the Design Solution

		<p>Crosscutting Concepts:</p> <ul style="list-style-type: none"> • Cause and Effect: Mechanism and explanation • Scale, Proportion, and Quantity • Energy and Matter <p>Science and Engineering Practices:</p> <ul style="list-style-type: none"> • Constructing explanations and designing solutions • Analyzing and interpreting data • Obtaining, evaluating, and communicating information <p>Nature of Science: Science is a human endeavor.</p>
<p><i>Is Iron the Most Important Element?</i></p>	<p>Chemistry Basics – Elements</p> <p>Molecules & bonding – alloys; metallic bonding; ionic bonding; molecular structure</p> <p>Reactions & Stoichiometry – combustion</p>	<p>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.</p> <p>HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements.</p> <p>Disciplinary Core Ideas:</p> <ul style="list-style-type: none"> • PS1.A: Structure and Properties of Matter • ESS1.A: The Universe and Its Stars <p>Crosscutting Concepts:</p> <ul style="list-style-type: none"> • Patterns • Cause and Effect: Mechanism and explanation • Stability and Change <p>Science and Engineering Practices:</p> <ul style="list-style-type: none"> • Analyzing and interpreting data • Constructing explanations (for science) and designing solutions (for engineering) • Engaging in argument from evidence <p>Nature of Science:</p> <ul style="list-style-type: none"> • Scientific knowledge is based on empirical evidence. • Scientific knowledge assumes an order and consistency in natural systems
<p><i>Crystal Caves</i></p>	<p>Chemistry Basics</p> <ul style="list-style-type: none"> • Physical properties • Inference <p>Solutions</p> <ul style="list-style-type: none"> • Solubility • Solute/ solvent <p>States of Matter</p>	<p>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.</p> <p>HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.</p> <p>Disciplinary Core Ideas:</p> <ul style="list-style-type: none"> • PS1.A: Structure and Properties of Matter • ESS2.C: The Roles of Water in Earth’s Surface Processes <p>Crosscutting Concepts:</p> <ul style="list-style-type: none"> • Cause and Effect: Mechanism and explanation. • Scale, Proportion, and Quantity

		<ul style="list-style-type: none"> • Structure and Function • Stability and Change <p>Science and Engineering Practices:</p> <ul style="list-style-type: none"> • Analyzing and interpreting data • Asking questions (for science) and defining problems (for engineering) <p>Nature of Science:</p> <ul style="list-style-type: none"> • Scientific knowledge is based on empirical evidence. • Science addresses questions about the natural and material world
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Correlations to Common Core State Standards



Note: ELA-Literacy Common Core State Standards Connections for all articles

- **ELA-Literacy.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.
- **ELA-Literacy.RST.9-10.2:** Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- **ELA-Literacy.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*).
- **ELA-Literacy.RST.9-10.8:** Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
- **ELA-Literacy.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.
- **ELA-Literacy.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.
- **ELA-Literacy.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*.
- **ELA-Literacy.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.

In addition, the teacher could assign writing to include the following **Common Core State Standards:**

- **ELA-Literacy.WHST.9-10.2:** Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- **ELA-Literacy.WHST.9-10.2F:** Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
- **ELA-Literacy.WHST.11-12.2:** Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- **ELA-Literacy.WHST.11-12.2E:** Provide a concluding statement or section that follows from or supports the argument presented.