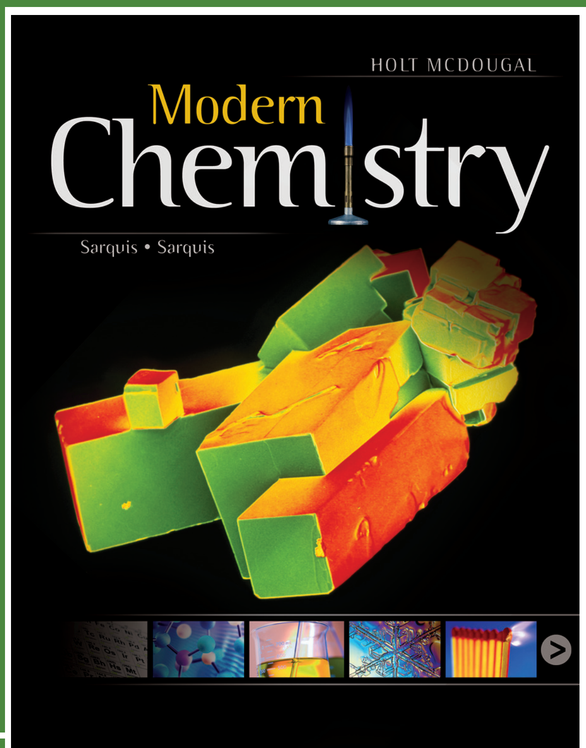
Houghton Mifflin Harcourt

Correlation to the

Oklahoma Academic Standards for Science Chemistry



Holt McDougal
Modern Chemistry

(Houghton Mifflin Harcourt) (Holt McDougal Modern Chemistry)

CORRELATIONS WITH
OKLAHOMA ACADEMIC STANDARDS

**Health, Vocational Education
and Computer Education/Instructional
Technology and Grades PreK-12 Science,
PreK-5 Science Content Reading**

Grades 9–12
Chemistry

Correlation Location	Oklahoma Academic Standards: Chemistry
HS-PS1-1: Matter and Its Interactions	
Print or Online SE/TE: Page 128 **Online Labs:** **Core Skills Labs:** The Mendeleev Lab of 1869 (Section 5.1); Reactivity of Halide Ions (5.2); Periodicity of Properties of Oxides (5.3); Exploring the Periodic Table (5.3)	**Performance Expectation HS-PS1-1** *Students who demonstrate understanding can:* **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.** **Clarification Statement:** Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen. **Assessment Boundary:** Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.

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Correlation Location	Oklahoma Academic Standards: Chemistry
<u>Print or Online SE/TE:</u> Pages 16-20, 23, 68-83, 86, 90-116, 105-116, 118, 120-121, 127-129, 134-136, 137-141, 142-156, 158, 159, 160-162, 163, 165-167, 194-196, 200, 202-203, R2-R4, R8-R10,R14-R18, R24-R26, R28-R29, R44-R45, R48-R50, R54-R56 **<u>Print or Online TE Only:</u>** Page 7 **<u>Online Labs:</u>** **Core Skills Labs:** The Mendeleev Lab of 1869 (5.1); Reactivity of Halide Ions (5.2); Periodicity of Properties of Oxides (5.3); Exploring the Periodic Table (5.3)	**Disciplinary Core Ideas for Standard HS-PS1-1** **Structure and Properties of Matter:** • Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. • The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.
<u>Print or Online SE/TE:</u> Page 128 **<u>Online Labs:</u>** **Core Skills Labs:** The Mendeleev Lab of 1869 (5.1); Reactivity of Halide Ions (5.2); Periodicity of Properties of Oxides (5.3); Exploring the Periodic Table (5.3) **Open Inquiry Lab:** Stoichiometry (9.3)	**Science and Engineering Practice for Standard HS-PS1-1** **Developing and using models:** Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Use a model to predict the relationships between systems or between components of a system.
<u>Print or Online SE/TE:</u> Pages 128, 137-138, 143 148, 159, 155, 156, 162, 204 **<u>Print or Online TE Only:</u>** Pages 16-19, 126-127, 130-134, 142, 152-153 **<u>Online Labs:</u>** **Core Skills Labs:** The Mendeleev Lab of 1869 (5.1); Reactivity of Halide Ions (5.2); Periodicity of Properties of Oxides (5.3); Exploring the	**Crosscutting Concept for Standard HS-PS1-1** **Patterns:** • 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.

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Correlation Location	Oklahoma Academic Standards: Chemistry
Periodic Table (5.3) **Open Inquiry Lab:** Stoichiometry (9.3) **STEM Labs:** Measure for Measure (2.2); Store Charge (20.2); Modeling Radioactive Decay on a Computer (21.2)	
HS-PS1-2 Matter and Its Interactions	
Online Labs: **Standard Labs:** Factors Affecting CO_2 Production in Yeast (8.3); Redox Titration (19.3); Redox Titration: Mining Feasibility Study (19.3) **Core Skills Labs:** Conservation of Mass (3.3); Reactivity of Halide Ions (5.2); Periodicity of Properties of Oxides (5.3); Evidence for Chemical Change (8.2); Colored Precipitates (13.1); Oxidation-Reduction Reactions (19.1); Rust Race (19.1); Reduction of Manganese in Permanganate Ion (19.2) **Forensics Lab:** Extraction of Copper From Its Ore (8.3) **Open Inquiry Lab:**Getting a Reaction (8.1)	**Performance Expectation HS-PS1-2** *Students who demonstrate understanding can:* **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, knowledge of the patterns of chemical properties, and formation of compounds.** **Clarification Statement:** Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen. Reaction classification aids in the prediction of products (e.g. synthesis/combination decomposition, single displacement, double displacement, oxidation/ reduction, acid/base). **Assessment Boundary:** Assessment is limited to chemical reactions involving main group elements and combustion reactions.

Correlation Location	Oklahoma Academic Standards: Chemistry
Print or Online SE/TE: Pages 7-11, 13, 16-20, 21, 63-65, 68-72, 85-86, 88, 89, 91-97, 98-104, 108-109, 110-115, 118, 119-120, 125-156, 157, 158-161, 162, 163, 504-514, 641-644, 645-652, 663-664, 669-672, 674-687, R2-R57 **Online Labs:** **Core Skill Labs:** The Mendeleev Lab of 1869 (5.1); Reactivity of Halide Ions (5.2); Exploring the Periodic Table (5.3); Periodicity of Properties of Oxides (5.3) ______________________________ **Print or Online SE/TE:** Pages 64-65, 67, 85, 86-88, 89, 225-232, 248-251, 254-260, 262-269, 270, 275, 276, 277-280, 467 **Online Labs:** **Core Skills Labs:** Conservation of Mass (3.3); Colored Precipitates (13.1) **Forensics Lab:** Extraction of Copper From Its Ore (8.3)	**Disciplinary Core Ideas for Standard HS-PS1-2** **Structure and Properties of Matter:** • The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. -- **Chemical Reactions:** • 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.
Print or Online SE/TE: Page 270 **Online Labs:** **Standard Labs:** Blueprint Paper (8.1), Factors Affecting CO_2 Production in Yeast (8.3), Redox Titration (19.3); Redox Titration: Mining Feasibility Study (19.3) **Core Skills Labs:** Conservation of Mass (3.3); Reactivity of Halide Ions	**Science and Engineering Practice for Standard HS-PS1-2** **Constructing explanations (for science) and designing solutions (for engineering):** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories. • Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own

Correlation Location	Oklahoma Academic Standards: Chemistry
(5.2); Periodicity of Properties of Oxides (5.3); Evidence for Chemical Change (8.2); Colored Precipitates (13.1); Oxidation-Reduction Reactions (19.1); Rust Race (19.1); Reduction of Manganese in Permanganate Ion (19.2) **Forensics Lab:** Extraction of Copper From Its Ore (8.3) **Open Inquiry Labs:** Getting a Reaction (8.1); Stoichiometry (9.3)	investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
Print or Online SE/TE: Pages 266, 269-270, 273, 278-280 **Print or Online TE Only:** Pages 262, 264-265, 268, 271 **Online Labs:** **Standard Labs:** Factors Affecting CO_2 Production in Yeast (8.3), Redox Titration (19.3); Redox Titration: Mining Feasibility Study (19.3) **Core Skills Labs:** Conservation of Mass (3.3); Reactivity of Halide Ions (5.2); Periodicity of Properties of Oxides (5.3); Evidence for Chemical Change (8.2); Colored Precipitates (13.1); Oxidation-Reduction Reactions (19.1); Rust Race (19.1); Reduction of Manganese in Permanganate Ion (19.2) **Forensics Lab:** Extraction of Copper From Its Ore (8.3) **Open Inquiry Labs:** Getting a Reaction (8.1); Stoichiometry (9.3) **STEM Labs:** Measure for Measure (2.2); Store Charge (20.2); Modeling Radioactive Decay on a Computer (21.2)	**Crosscutting Concept for Standard HS-PS1-2** **Patterns:** • 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.

Correlation Location	Oklahoma Academic Standards: Chemistry
HS-PS1-3 Matter and Its Interactions	
Print or Online TE Only: Pages 321, 328 **Online Labs:** **Forensics Lab:** Evaporation and Ink Solvents (10.3) **Core Skills Labs:** Conductivity as an Indicator of Bond Type (6.2); Chemical Bonds (6.3), Types of Bonding in Solids (6.4), Tests for Iron (II) and Iron (III) (7.2); Viscosity of Core Liquids (10.3); Reactivity of Halide Ions (5.2)	**Performance Expectation HS-PS1-3** *Students who demonstrate understanding can:* **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.** **Clarification Statement:** Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension. The intent of the performance expectation is limited to evaluation of bulk scale properties and not micro scale properties. **Assessment Boundary:** Assessment does not include Raoult's law calculations of vapor pressure.
Print or Online SE/TE: Pages 147-148, 149-151, 152-155, 165-167, 168-169, 171-174, 180, 185-186, 199, 200-203, 240 **Online Labs:** **Forensics Lab:** Evaporation and Ink Solvents (10.3) **Core Skills Labs:** Conductivity as an Indicator of Bond Type (6.2); Chemical Bonds (6.3); Types of Bonding in Solids (6.4); Reactivity of Halide Ions (5.2)	**Disciplinary Core Ideas for Standard HS-PS1-3** **Structure and Properties of Matter:** • The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms.

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Correlation Location	Oklahoma Academic Standards: Chemistry
Print or Online TE Only: Page 328 **Online Labs:** **Forensics Lab:** Evaporation and Ink Solvents (10.3) **Open Inquiry Labs:** Getting a Reaction (8.1); Measure for Measure (2.2) **Core Skills Labs:** Tests for Iron (II) and Iron (III) (7.2); Is It an Acid or a Base? (14.1); Reactivity of Halide Ions (5.2);Conductivity as an Indicator of Bond Type (6.2); Chemical Bonds (6.3); Types of Bonding in Solids (6.4); Viscosity of Core Liquids (10.3); “Wet” Dry Ice (10.4); Constructing a Heating/Cooling Curve (10.4) **Standard Lab:** Clock Reactions (17.2); Reaction Rates (17.3)	**Science and Engineering Practice for Standard HS-PS1-3** **Planning and carrying out investigations:** Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models. • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
Print or Online SE/TE: Pages 243-244, 338 **Print or Online TE Only:** Pages 317, 328, 332 **Online Labs:** **Core Skills Labs:** Reactivity of Halide Ions (5.2), Conductivity as an Indicator of Bond Type (6.2); Chemical Bonds (6.3); Types of Bonding in Solids (6.4); Tests for Iron (II) and Iron (III) (7.2); Viscosity of Core Liquids (10.3); “Wet” Dry Ice (10.4); Constructing a Heating/Cooling Curve (10.4) **Open Inquiry Lab:** Stoichiometry (9.3) **Forensics Lab:** Evaporation and Ink Solvents (10.3) **STEM Labs:** Measure for Measure (2.2); Store Charge (20.2); Modeling Radioactive Decay on a Computer (21.2)	**Crosscutting Concept for Standard HS-PS1-3** **Patterns:** • 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.

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<table>
<tr><th>Correlation Location</th><th>Oklahoma Academic Standards: Chemistry</th></tr>
<tr><td colspan="2">HS-PS1-4 Matter and Its Interactions</td></tr>
<tr><td><u>Print or Online TE Only:</u>
Page 532 (Problem Solving activity)

<u>Online Labs:</u>
Forensics Lab: Measuring the Release of Energy from Sucrose (23.1)</td><td>Performance Expectation HS-PS1-4

Students who demonstrate understanding can:

<u>Develop a model to illustrate that</u> the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

Clarification Statement:
Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.

Assessment Boundary:
N/A</td></tr>
<tr><td><u>Print or Online SE/TE:</u>
Pages 529-532, 536-546, 549, 551, 553

<u>Online Labs:</u>
Forensics Labs: Measuring the Release of Energy from Sucrose (23.1); A Leaky Reaction (17.2)
Standard Labs: Reaction Rates (17.3); Factors Affecting CO_2 Production in Yeast (8.3)
Core Skills Lab: Rate of a Chemical Reaction (17.2)
Open Inquiry Lab: Reaction Action (17.2)
Quick Lab: Concentration Affects Reaction Rate (17.2)

<u>Additional Online Resources:</u>
Presentation Tools/Teaching Visuals: Conservation of Energy in a Chemical Reaction (Section 2.2)</td><td>Disciplinary Core Ideas for Standard HS-PS1-4

Structure and Properties of Matter:
• 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.

Chemical Reactions:
• 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.</td></tr>
</table>

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Correlation Location	Oklahoma Academic Standards: Chemistry
Print or Online SE/TE: Page 67 **Print or Online TE Only:** Page 532 (Problem Solving activity) **Online Labs:** **Forensics Lab:** Measuring the Release of Energy from Sucrose (23.1) **STEM Lab:** Store Charge (20.2) **Open Inquiry Labs:** Stoichiometry (9.3); Repulsion Compulsion (6.5)	**Science and Engineering Practice for Standard HS-PS1-4** **Developing and using models**: Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Develop a model based on evidence to illustrate the relationships between systems or between components of a system.
Print or Online SE/TE: Pages 9-11, 502, 614 (#29) **Online Labs:** **Forensics Lab:** Measuring the Release of Energy from Sucrose (23.1) **Open Inquiry Labs:** Reaction Action (17.2); Repulsion Compulsion (6.5) **STEM Labs:** Store Charge (20.2); Modeling Radioactive Decay on a Computer (21.2) **Additional Online Resources:** **Presentation Tools/Teaching Visuals:** Conservation of Energy in a Chemical Reaction (Section 2.2)	**Crosscutting Concept for Standard HS-PS1-4** **Energy and Matter:** • 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.

Correlation Location	Oklahoma Academic Standards: Chemistry
HS-PS1-5 Matter and Its Interactions	
Print or Online SE/TE: Page 546 **Print or Online TE Only:** Pages 552 (#22) **Online Labs:** **Standard Labs:** Factors Affecting CO_2 Production in Yeast (8.3); Reaction Rates (17.3) **Core Skills Lab:** Rate of a Chemical Reaction (17.2) **Open Inquiry Lab:** Reaction Action (17.2) **Quick Lab:** Concentration Affects Reaction Rate (17.2) **Forensics Lab:** A Leaky Reaction (17.2)	**Performance Expectation HS-PS1-5** *Students who demonstrate understanding can:* **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.** **Clarification Statement:** Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules. **Assessment Boundary:** Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.
Print or Online SE/TE: Pages 529-535, 536-546, 548-552 **Online Labs:** **Standard Labs:** Reaction Rates (17.3); Factors Affecting CO_2 Production in Yeast (8.3) **Core Skills Lab:** Rate of a Chemical Reaction (17.2) **Open Inquiry Lab:** Reaction Action (17.2) **Quick Lab:** Concentration Affects Reaction Rate (17.2) **Forensics Labs:** Measuring the Release of Energy from Sucrose (23.1); A Leaky Reaction (17.2)	**Disciplinary Core Ideas for Standard HS-PS1-5** **Chemical Reactions:** • 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.

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Correlation Location	Oklahoma Academic Standards: Chemistry
Print or Online SE/TE: Page 546 **Print or Online TE Only:** Pages 552 (#22) **Online Labs:** **Standard Labs:** Factors Affecting CO_2 Production in Yeast (8.3); Reaction Rates (17.3) **Core Skills Lab:** Rate of a Chemical Reaction (17.2) **Open Inquiry Lab:** Reaction Action (17.2) **Quick Lab:** Concentration Affects Reaction Rate (17.2) **Forensics Lab:** A Leaky Reaction (17.2)	**Science and Engineering Practice for Standard HS-PS1-5** **Constructing explanations (for science) and designing solutions (for engineering):** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories. • Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects.
Print or Online SE/TE: Page 546 **Print or Online TE Only:** Page 552 (#22) **Online Labs:** **Standard Labs:** Factors Affecting CO_2 Production in Yeast (8.3); Reaction Rates (17.3) **Core Skills Labs:** Rate of a Chemical Reaction (17.2) **Open Inquiry Labs:** Stoichiometry (9.3); Reaction Action (17.2) **Quick Lab:** Concentration Affects Reaction Rate (17.2) **Forensics Lab:** A Leaky Reaction (17.2) **STEM Labs:** Measure for Measure (2.2); Store Charge (20.2); Modeling Radioactive Decay on a Computer (21.2)	**Crosscutting Concept for Standard HS-PS1-5** **Patterns:** • 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.

<table>
<tr><th>Correlation Location</th><th>Oklahoma Academic Standards: Chemistry</th></tr>
<tr><td colspan="2">HS-PS1-6 Matter and Its Interactions</td></tr>
<tr><td><u>Online Lab:</u>
Virtual Lab: Exploring Reaction Rates (Chapter 17)</td><td>Performance Expectation HS-PS1-6

Students who demonstrate understanding can:

<u>Refine the design of a chemical system by specifying</u> a change in conditions that would produce increased amounts of products at equilibrium.*

Clarification Statement:
Emphasis is on the application of Le Chatelier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products.

Assessment Boundary:
Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.</td></tr>
<tr><td><u>Print or Online SE/TE:</u>
Pages 253, 255, 530, 555-561, 589, 592

<u>Online Labs:</u>
Virtual Labs: Exploring Reaction Rates (Chapter 17); Investigating Dynamic Equilibrium (Chapter 18)
Core Skill Lab: Equilibrium (18.2)</td><td>Disciplinary Core Ideas for Standard HS-PS1-6

Chemical Reactions:
• 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.</td></tr>
</table>

Correlation Location	Oklahoma Academic Standards: Chemistry
Online Labs: **Virtual Lab:** Exploring Reaction Rates (Chapter 17)	**Disciplinary Core Ideas for Standard HS-PS1-6** ***continued*** **Optimizing the Design Solution:** • Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain over others (trade-offs) may be needed.
Online Labs: **Virtual Lab:** Exploring Reaction Rates (Chapter 17) **STEM Lab:** The Heat is ON! (13.2)	**Science and Engineering Practice for Standard HS-PS1-6** **Constructing explanations (for science) and designing solutions (for engineering) :** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories. • Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.
Online Labs: **Virtual Labs:** Exploring Reaction Rates (Chapter 17); Investigating Dynamic Equilibrium (Chapter 18) **Core Skill Lab:** Equilibrium (18.2) **STEM Labs:** The Heat is ON! (13.2); Modeling Radioactive Decay on a Computer (21.2)	**Crosscutting Concept for Standard HS-PS1-6** **Stability and Change:** • Much of science deals with constructing explanations of how things change and how they remain stable.

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Correlation Location	Oklahoma Academic Standards: Chemistry
HS-PS1-7 Matter and Its Interactions	
Print or Online SE/TE: Pages 284, 293-295, 297-302 **Print or Online TE Only:** Pages 288 (Classroom Catalyst), 651 (Differentiated Instruction) **Online Labs:** **Core Skills Lab:** Conservation of Mass (3.3) **Open Inquiry Lab:** Stoichiometry (9.3) **Forensics Labs:** Stoichiometry and Gravimetric Analysis (9.3)	**Performance Expectation HS-PS1-7** *Students who demonstrate understanding can:* **Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.** **Clarification Statement:** Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale (i.e., Conservation of Mass and Stoichiometry). Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques. **Assessment Boundary:** Assessment does not include complex chemical reactions.
Print or Online SE/TE: Pages 64-65, 283-284, 288, 293-295, 297-302, 303, 305-308 **Online Labs:** **Core Skills Lab:** Conservation of Mass (3.3) **Open Inquiry Lab:** Stoichiometry (9.3) **Forensics Lab:** Stoichiometry and Gravimetric Analysis (9.3) **Standard Lab:** Gravimetric Analysis - Hard Water Testing (9.3)	**Disciplinary Core Ideas for Standard HS-PS1-7** **Chemical Reactions:** • 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.

Correlation Location	Oklahoma Academic Standards: Chemistry
Print or Online SE/TE: Pages 284, 293-295, 297-302 **Print or Online TE Only:** Pages 288 (Classroom Catalyst), 651 (Differentiated Instruction), 526 (#45) **Online Labs:** **Core Skills Lab:** Conservation of Mass (3.3) **Open Inquiry Lab:** Stoichiometry (9.3) **Forensics Lab:** Stoichiometry and Gravimetric Analysis (9.3)	**Science and Engineering Practice for Standard HS-PS1-7** **Using mathematics and computational thinking:** Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. • Use mathematical representations of phenomena to support claims.
Print or Online SE/TE: Page 325 **Online Labs:** **Core Skills Lab:** Conservation of Mass (3.3) **Open Inquiry Lab:** Stoichiometry (9.3) **Additional Online Resources:** **Presentation Tools/Teaching Visuals:** Conservation of Energy in a Chemical Reaction (Section 2.2)	**Crosscutting Concept for Standard HS-PS1-7** **Energy and Matter:** • The total amount of energy and matter in closed systems is conserved.

Correlation Location	Oklahoma Academic Standards: Chemistry
HS-PS1-8 Matter and Its Interactions	
Online Labs: **STEM Lab:** Modeling Radioactive Decay on Computer (21.2) **Core Skill Lab:** Detecting Radioactivity (21.3)	**Performance Expectation HS-PS1-8** *Students who demonstrate understanding can:* **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.** **Clarification Statement:** Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations. **Assessment Boundary:** Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.
Print or Online SE/TE: Pages 641-644, 645-651, 657-661, 664-666 **Print or Online TE Only:** Page 71 (ChemsTrivia) **Online Labs:** **STEM Lab:** Modeling Radioactive Decay on Computer (21.2) **Core Skill Lab:** Detecting Radioactivity (21.3) **Virtual Lab:** Exploring Radioactivity (Chapter 21)	**Disciplinary Core Ideas for Standard HS-PS1-8** **Nuclear Processes:** • Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy.

Correlation Location	Oklahoma Academic Standards: Chemistry
Online Labs: **STEM Lab:** Modeling Radioactive Decay on Computer (21.2) **Core Skill Lab:** Detecting Radioactivity (21.3) **Virtual Lab:** Exploring Reaction Rates (Chapter 17) **Open Inquiry Lab:** Stoichiometry (9.3)	**Science and Engineering Practice for Standard HS-PS1-8** **Developing and using models**: Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Develop a model based on evidence to illustrate the relationships between systems or between components of a system.
Print or Online SE/TE: Page 644 **Print or Online TE Only:** Pages 641, 643, 646, 650-651, 654, 657	**Crosscutting Concept for Standard HS-PS1-8** **Energy and Matter:** • In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.
HS-PS2-6 Motion and Stability: Forces and Interactions	
Online Labs: **Core Skills Lab:** Polymers (22.4) **Standard Labs:** Polymers and Toy Balls (22.4); The Slime Challenge (22.4)	**Performance Expectation HS-PS2-6** *Students who demonstrate understanding can:* **Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.*** **Clarification Statement:** Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors. **Assessment Boundary:** Assessment is limited to provided molecular structures of specific designed materials.

Correlation Location	Oklahoma Academic Standards: Chemistry
Print or Online SE/TE: Pages 147-148, 149-151, 152-155, 165-167, 168-169, 171-174, 180, 185-186, 193-197, 199, 200-203, 240, 693-697 **Online Labs:** **Core Skills Lab:** Conductivity as an Indicator of Bond Type (6.2); Chemical Bonds (6.3); Types of Bonding in Solids (6.4); Polymers (22.4) **Standard Labs:** Polymers and Toy Balls (22.4); The Slime Challenge (22.4)	**Disciplinary Core Ideas for Standard HS-PS2-6** **Types of Interactions:** • Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.
Online Labs: **Core Skills Lab:** Polymers (22.4) **Standard Labs:** Polymers and Toy Balls (22.4); The Slime Challenge (22.4)	**Science and Engineering Practice for Standard HS-PS2-6** **Obtaining, evaluating, and communicating information:** Obtaining, evaluating, and communicating information in 9–12 builds on K –8 and progresses to evaluating the validity and reliability of the claims, methods, and designs. • Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).
Online Labs: **Core Skills Lab:** Polymers (22.4) **Standard Labs:** Polymers and Toy Balls (22.4); The Slime Challenge (22.4) **STEM Labs:** Store Charge (20.2); The Heat is ON! (13.2)	**Crosscutting Concept for Standard HS-PS2-6** **Structure and Function:** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

Correlation Location	Oklahoma Academic Standards: Chemistry
HS-PS3-3 Energy	
Online Labs: **STEM Lab:** Store Charge (20.2) **Core Skills Labs:** Voltaic Cells (20.2); Electroplating for Corrosion Protection (20.3)	**Performance Expectation HS-PS3-3** *Students who demonstrate understanding can:* **Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*** **Clarification Statement:** Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency. **Assessment Boundary:** Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.
Print or Online SE/TE: Pages 10, 247, 312, 501-504, 516-520, 617-619, 620-627, 628, 629-633, 635, 636-637, 645-647, 657-659, 665, 666 **Print or Online TE Only:** Pages 616, 638 **Online Labs:** **STEM Labs:** Store Charge (20.2); A Burning Interest (16.1) **Core Skills Lab(s):** Voltaic Cells (20.2); Electroplating for Corrosion Protection (20.3)	**Disciplinary Core Ideas for Standard HS-PS3-3** **Definitions of Energy:** • At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.

Correlation Location	Oklahoma Academic Standards: Chemistry
Forensics Labs: Evaluating Fuels (16.1); Measuring the Release of Energy from Sucrose (23.1) **Probeware Labs:** Energy Content of Foods (16.1); Establishing a Table of Reduction Potentials: Micro-Voltaic Cells (20.2) ____ **Print or Online SE/TE:** Pages 658-659, 666 ____ **Print or Online SE/TE:** Pages 18, 170, 429, 547, 628, 658 **Online Labs:** **Standard Lab:** An Introduction to Chemical Engineering (1.1) **Virtual Lab:** Exploring Reaction Rates (Chapter 17)	**Disciplinary Core Ideas for Standard HS-PS3-3** ***continued*** ____ **Defining and Delimiting Engineering Problems:** (secondary to HS-PS3-3) • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. ____ **Interdependence of Science, Engineering, and Technology:** • Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.
Online Labs: **Virtual Lab:** Exploring Reaction Rates (Chapter 17) **Core Skills Lab(s):** Voltaic Cells (20.2); Electroplating for Corrosion Protection (20.3) **STEM Labs:** Store Charge (20.2); Living in a Thirsty World (1.2); The Heat is ON! (13.2); A Burning Interest (16.1); Cleaning Up Oil Spills (22.2)	**Science and Engineering Practice for Standard HS-PS3-3** **Constructing explanations (for science) and designing solutions (for engineering):** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories. • Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Correlation Location	Oklahoma Academic Standards: Chemistry
Print or Online SE/TE: Pages 9-11, 502, 614 (#29) **Online Labs:** **STEM Labs:** Store Charge (20.2); A Burning Interest (16.1) **Forensics Labs:** Measuring the Release of Energy from Sucrose (23.1); Evaluating Fuels (16.1) **Core Skill Labs:** Voltaic Cells (20.2); Electroplating for Corrosion Protection (20.3); Conservation of Mass (3.3) **Probeware Labs:** Energy Content of Foods (16.1); Establishing a Table of Reduction Potentials: Micro-Voltaic Cells (20.2) **Virtual Lab:** Exploring Reaction Rates (Chapter 17) **Additional Online Resources:** **Presentation Tools/Teaching Visuals:** Conservation of Energy in a Chemical Reaction (Section 2.2)	**Crosscutting Concept for Standard HS-PS3-3** **Energy and Matter:** • 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.
HS-PS3-4 Energy	
Print or Online SE/TE: Page 526 (#45) **Online Labs:** **STEM Lab:** A Burning Interest (16.1) **Standard Labs:** Counting Calories (16.1); Temperature of a Bunsen Burner Flame (16.1) **Core Skills Lab:** Calorimetry and Hess's Law (16.1) **Forensics Lab:** Evaluating Fuels (16.1) **Probeware Lab:** Energy Content Of Food (16.1)	**Performance Expectation HS-PS3-4** *Students who demonstrate understanding can:* **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).** **Clarification Statement:** Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at

Correlation Location	Oklahoma Academic Standards: Chemistry
	different initial temperatures or adding objects at different temperatures to water. **Assessment Boundary:** Assessment is limited to investigations based on materials and tools provided to students.
Print or Online SE/TE: Pages 11, 332-333, 334, 501-514, 516-520, 521, 523-525, 526(#45), 527 **Print or Online TE Only:** Page 328 **Online Labs:** **STEM Labs:** Store Charge (20.2); Modeling Radioactive Decay on a Computer (21.2); A Burning Interest (16.1) **Standard Labs:** Counting Calories (16.1); Temperature of a Bunsen Burner Flame (16.1) **Core Skills Lab:** Calorimetry and Hess's Law (16.1) **Forensics Lab:** Evaluating Fuels (16.1) **Probeware Lab:** Energy Content Of Food (16.1) **Additional Online Resources:** **Presentation Tools/Teaching Visuals:** Conservation of Energy in a Chemical Reaction (Section 2.2)	**Disciplinary Core Ideas for Standard HS-PS3-4** **Conservation of Energy and Energy Transfer:** • Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. • Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down).

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CORRELATIONS WITH
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Correlation Location	Oklahoma Academic Standards: Chemistry
Online Labs: **STEM Labs:** A Burning Interest (16.1); Store Charge (20.2); Modeling Radioactive Decay on a Computer (21.2) **Open Inquiry Labs:** Getting a Reaction (8.1); Measure for Measure (2.2) **Standard Lab:** Reaction Rates (17.3) **Core Skill Lab:** Conservation of Mass (3.3)	**Science and Engineering Practice for Standard HS-PS3-4** **Planning and carrying out investigations:** Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models. • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
Online Labs: **STEM Labs:** Store Charge (20.2); Modeling Radioactive Decay on a Computer (21.2); A Burning Interest (16.1) **Standard Labs:** Counting Calories (16.1); Temperature of a Bunsen Burner Flame (16.1) **Core Skills Lab:** Calorimetry and Hess's Law (16.1) **Forensics Lab:** Evaluating Fuels (16.1) **Probeware Lab:** Energy Content Of Food (16.1)	**Crosscutting Concept for Standard HS-PS3-4** **System and System Models:** • When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

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CORRELATIONS WITH
OKLAHOMA ACADEMIC STANDARDS

Correlation Location	Oklahoma Academic Standards: Chemistry
HS-PS4-1 Waves and Their Applications in Technologies for Information Transfer	
Print or Online SE/TE: Page 122 (#53) **Print or Online TE Only:** Pages 94 (Problem Solving), 95 (Alternative Approaches)	**Performance Expectation HS-PS4-1** *Students who demonstrate understanding can:* **Use mathematical representations to describe relationships among the frequency, wavelength, and speed of waves.** **Clarification Statement:** Examples of data could include relationship to the electromagnetic spectrum. **Assessment Boundary:** Assessment is limited to algebraic relationships and describing those relationships qualitatively
Print or Online SE/TE: Pages 91-97, 119 **Print or Online TE Only:** Page 118	**Disciplinary Core Ideas for Standard HS-PS4-1** **Wave Properties:** • The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.
Print or Online SE/TE: Page 122 (#53) **Print or Online TE Only:** Pages 94 (Problem Solving), 95 (Alternative Approaches), 566 (Problem Solving exercise), 526 (#45) **Online Labs:** **Core Skills Lab:** Conservation of Mass (3.3) **Open Inquiry Lab:** Stoichiometry (9.3)	**Science and Engineering Practice for Standard HS-PS4-1** **Using mathematics and computational thinking:** Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. • Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.

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CORRELATIONS WITH OKLAHOMA ACADEMIC STANDARDS

Correlation Location	Oklahoma Academic Standards: Chemistry
Print or Online SE/TE: Pages 30, 91-97 **Online Lab:** **STEM Lab:** The Heat is ON! (13.2)	**Crosscutting Concept for Standard HS-PS4-1** **Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
HS-PS4-3 Waves and Their Applications in Technologies for Information Transfer	
Print or Online SE/TE: Pages 100, 119 (#7) **Print or Online TE Only:** Pages 91 (Classroom Catalyst)	**Performance Expectation HS-PS4-3** *Students who demonstrate understanding can:* **Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.** **Clarification Statement:** Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect. **Assessment Boundary:** Assessment does not include using quantum theory.

Correlation Location	Oklahoma Academic Standards: Chemistry
Print or Online SE/TE: Pages 91-97, 98, 100, 118, 119	**Disciplinary Core Ideas for Standard HS-PS4-3** **Wave Properties:** • Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. (Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.) **Electromagnetic Radiation:** • Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features.
Print or Online SE/TE: Pages 100, 119 (#7) **Print or Online TE Only:** Pages 91 (Classroom Catalyst), 564 (Differentiated Instruction: Pre-AP activity)	**Science and Engineering Practice for Standard HS-PS4-3** **Engaging in argument from evidence:** Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science. • Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.

Correlation Location	Oklahoma Academic Standards: Chemistry
Online Labs: **STEM Labs:** Modeling Radioactive Decay on a Computer (21.2) **Open Inquiry Lab:** Stoichiometry (9.3)	**Crosscutting Concept for Standard HS-PS4-3** **Cause and Effect:** • Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales.