NEXT GENERATION SCIENCE STANDARDS

Inspire Chemistry is designed to meet 100% of the Next Generation Science Standards through both print and digital resources. The Student Edition, accessible in print and online, can be used as a research tool by students as they investigate concepts and collect evidence. Interactive Digital Content, labs, and projects that support the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts, as well as CCSS Mathematics and ELA/Literacy, are available online.

Correlation of *Inspire Chemistry* to the NGSS

HS-PS1	Matter and Its Interactions	
HS-PS1–1.	**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 reactivities 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.]*	**Online:** Applying Practices: *Electron Patterns in Atoms* STEM Unit Project 1

SEP Science and Engineering Practices	
Developing and Using Models • Use a model to predict the relationships between systems or between components of a system.	**Online:** *Science and Engineering Practices Handbook:* Practice 2

DCI Disciplinary Core Ideas	
PS1.A: 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.	**Student Edition:** 82–90, 90 Q6, 91–97, 94 Q15-Q16, 116–125, 126–132
• 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.	**Student Edition:** 91, 96–97, p96 Get It?, 97 Q20, 138–145, 146–151, 151 Q14, 152–160, 168–172, 172 Q1 and Q3, 173–175, 175 Q11, 183 Q23, 195–197, 602–604

CCC Crosscutting Concepts	
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.	**Online:** *Science and Engineering Practices Handbook*

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CCSS ELA/Literacy	
RST.9–10.7	**Online:** Applying Practices: *Electron Patterns in Atoms* STEM Unit Project 1

HS-PS1	Matter and Its Interactions	
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.** *[Clarification Statement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.] [Assessment Boundary: Assessment is limited to chemical reactions involving main group elements and combustion reactions.]*	**Online:** Applying Practices: *Electron States and Simple Chemical Reactions* Applying Practices: *Redox Reactions* STEM Unit Project 2

SEP Science and Engineering Practices	
Constructing Explanations and Designing Solutions • Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own 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.	**Online:** *Science and Engineering Practices Handbook:* Practice 6

DCI Disciplinary Core Ideas	
PS1.A: 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.	**Student Edition:** 91, 95–97, p96 Get It?, 97 Q20, 138–145, 146–151, 151 Q14, 152–160, 168–172, 172 Q1 and Q3, 173–175, 175 Q11, 183 Q23, 195–197, 604
PS1.B: 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.	**Student Edition:** 57–59; 81; 81 Q4; 173–175; 175 Q7–10; 180–186; 183 Q19–22; 184 Q24–26; 186 Q36–39; 241–244; 245–254; 254 Q33; 255–265; 314–319; 320–325; 326–331; 332–335; 600–603; 602–608; 602 Get It?; 608 Q10 and Q11; 613–616; 616 Q26; 708–709; 716–717; 717 Get It?; 717 Q15; Q17; 719–724; 724 Q19–21; 728–731; 731 Q22, Q23, Q25; 738, 738 Get It?

CCC Crosscutting Concepts	
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.	**Online:** *Science and Engineering Practices Handbook*

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CCSS Mathematics	
N-Q.1–3	**Online:** Applying Practices: *Electron States and Simple Chemical Reactions* STEM Unit Project 2
CCSS ELA/Literacy	
WHST.11–12.2, WHST.11–12.5	**Online:** Applying Practices: *Electron States and Simple Chemical Reactions* STEM Unit Project 2

HS-PS1	**Matter and Its Interactions**	
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.** *[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.] [Assessment Boundary: Assessment does not include Raoult's law calculations of vapor pressure.]*	**Online:** Applying Practices: *Investigate Interparticle Forces* STEM Unit Project 3
SEP Science and Engineering Practices		
Planning and Carrying Out Investigations • 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:** *Science and Engineering Practices Handbook:* Practice 3
DCI Disciplinary Core Ideas		
PS1.A: Structure and Properties of Matter • The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms.		**Student Edition:** 83–90; 85 Get It?; 90 Q8; 157–160, 168–172, 173–179; 176 Get It?; 175–179; 178 Get It?; 179 Q14 and Q15; 187–190; 189 Get It?; 188–190; 190 Q40, Q42, Q44; 198; 203–204; 229–231; 354–358; 358 Q14 and Q15; 361–364, 398; 398 Get It?; 411–414; 414 Q6; 436–437; 437 Get It?; 439–440; 602; 746–747; 747 Get It?

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CCC Crosscutting Concepts	
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.	**Online:** *Science and Engineering Practices Handbook*
CCSS Mathematics	
N-Q.1–3	**Online:** Applying Practices: *Investigate Interparticle Forces* STEM Unit Project 3
CCSS ELA/Literacy	
RST.11–12.1, WHST.11–12.7, WHST.11–12.8, WHST.11–12.9	**Online:** Applying Practices: *Investigate Interparticle Forces* STEM Unit Project 3

HS-PS1	Matter and Its Interactions	
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.** *[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: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.]*	**Online:** Applying Practices: *Modeling Energy in Chemical Reactions* STEM Unit Project 3
SEP Science and Engineering Practices		
Developing and Using Models • Develop a model based on evidence to illustrate the relationships between systems or between components of a system.		**Online:** *Science and Engineering Practices Handbook:* Practice 2
DCI Disciplinary Core Ideas		
PS1.A: 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.		**Student Edition:** 129, 153–154, 178–179, 179 Q13, 196–199, 199 Get It?, 203–204, 204 Q7

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PS1.B: 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.	**Student Edition:** 203–204; 448–455; 456–462; 463–467; 468–476; 491–499; 499 Q4, Q8, Q10; 500–506; 514–516; 613 Get It?
CCC Crosscutting Concepts	
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.	**Online:** *Science and Engineering Practices Handbook* **Student Edition:** 459–462
CCSS Mathematics	
MP.4, N-Q.1–3	**Online:** Applying Practices: *Modeling Energy in Chemical Reactions* STEM Unit Project 3
CCSS ELA/Literacy	
SL.11–12.5	**Online:** Applying Practices: *Modeling Energy in Chemical Reactions* STEM Unit Project 3

HS-PS1	**Matter and Its Interactions**	
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.** *[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.]*	**Online:** Applying Practices: *Concentration, Temperature, and Reaction Rates* STEM Unit Project 3
SEP Science and Engineering Practices		
Constructing Explanations and Designing Solutions • Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects.		**Online:** *Science and Engineering Practices Handbook:* Practice 6

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DCI Disciplinary Core Ideas	
PS1.B: 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.	**Student Edition:** 203–204; 448–455; 456–462; 463–467; 468–476; 491–499; 499 Q4, Q8, Q10; 500–506; 514–516; 616 Q27
CCC Crosscutting Concepts	
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."	**Online:** *Science and Engineering Practices Handbook*
CCSS Mathematics	
MP.2, N-Q.1–3	**Online:** Applying Practices: *Modeling Energy in Chemical Reactions* STEM Unit Project 3
CCSS ELA/Literacy	
RST.11–12.1, WHST.11–12.2	**Online:** Applying Practices: *Modeling Energy in Chemical Reactions* STEM Unit Project 3

HS-PS1	Matter and Its Interactions	
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.*** *[Clarification Statement: Emphasis is on the application of Le Châtelier'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.]*	**Online:** Applying Practices: *Food for Thought* STEM Unit Project 3
SEP Science and Engineering Practices		
Constructing Explanations and Designing Solutions • Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.		**Online:** *Science and Engineering Practices Handbook:* Practice 6

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DCI **Disciplinary Core Ideas**	
PS1.B: 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.	**Student Edition:** 522–534, 535–540, p538 caption question, 541–552, 553; 635; 643 Q16; 647
ETS1.C: 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 criteria over others (trade-offs) may be needed. (secondary)	**Online:** *Science and Engineering Practices Handbook:* Practice 1, Practice 6
CCC **Crosscutting Concepts**	
Stability and Change • Much of science deals with constructing explanations of how things change and how they remain stable.	**Online:** *Science and Engineering Practices Handbook*
CCSS ELA/Literacy	
WHST.11–12.7	**Online:** Applying Practices: *Modeling Energy in Chemical Reactions* STEM Unit Project 3

HS-PS1	Matter and Its Interactions	
HS-PS1–7.	**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. 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.]*	**Online:** Applying Practices: *Conservation of Mass* Applying Practices: *Conservation of Mass—Redox Reactions* STEM Unit Project 2

SEP **Science and Engineering Practices**	
Using Mathematics and Computational Thinking • Use mathematical representations of phenomena to support claims.	**Online:** *Science and Engineering Practices Handbook:* Practice 5

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DCI Disciplinary Core Ideas	
PS1.B: 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.	**Student Edition:** 48–54, 81, 241–244, 245–254, p254 Q33, 255–265, 287, 314–319, 320–325, 326–331, 332–335
CCC Crosscutting Concepts	
Energy and Matter • The total amount of energy and matter in closed systems is conserved.	**Online:** *Science and Engineering Practices Handbook* **Student Ediiton:** 57–59, 241–244, 449–450
Connections to Nature of Science **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Science assumes the universe is a vast single system in which basic laws are consistent.	**Online:** *Science and Engineering Practices Handbook*
CCSS Mathematics	
MP.2, N-Q.1–3	**Online:** Applying Practices: *Modeling Energy in Chemical Reactions* STEM Unit Project 2

HS-PS1	Matter and Its Interactions	
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.** *[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.]*	**Online:** Applying Practices: *Modeling Fission, Fusion, and Radioactive Decay* STEM Unit Project 5
SEP Science and Engineering Practices		
Developing and Using Models • Develop a model based on evidence to illustrate the relationships between systems or between components of a system.		**Online:** *Science and Engineering Practices Handbook:* Practice 2

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DCI Disciplinary Core Ideas	
PS1.C: Nuclear Processes • Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process.	**Student Edition:** 98–100, 765–770, 768 Get It?, 771–776, 782–792, 792 Q22
CCC Crosscutting Concepts	
Energy and Matter • In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.	**Student Edition:** 775–776
CCSS Mathematics	
MP.4, N-Q.1–3	**Online:** Applying Practices: *Modeling Energy in Chemical Reactions* STEM Unit Project 5

HS-PS2	Motion and Stability: Forces and Interactions	
HS-PS2–4.	**Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.** *[Clarification Statement: Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields.] [Assessment Boundary: Assessment is limited to systems with two objects.]*	**Online:** Applying Practices: *Modeling Electrostatic Forces—The Early Atom* Applying Practices: *Modeling Electrostatic Forces—Ionic and Metallic Bonding* Applying Practices: *Modeling Electrostatic Forces—Covalent Bonding* STEM Unit Project 1 STEM Unit Project 2

SEP Science and Engineering Practices	
Using Mathematics and Computational Thinking • Use mathematical representations of phenomena to describe explanations.	**Online:** *Science and Engineering Practices Handbook:* Practice 5
Connections to Nature of Science **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** • Theories and laws provide explanations in science. • Laws are statements or descriptions of the relationships among observable phenomena.	**Online:** *Science and Engineering Practices Handbook* **Student Edition:** 5–7

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DCI Disciplinary Core Ideas	
PS2.B: Types of Interactions Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects.	**Online:** Applying Practices: *Modeling Electrostatic Forces—The Early Atom* Applying Practices: *Modeling Electrostatic Forces—Ionic and Metallic Bonding* Applying Practices: *Modeling Electrostatic Forces—Covalent Bonding* STEM Unit Project 2 **Student Edition:** 83–90, 178–179, 179 Q12–18, 197–198, 203–204, 204 Q7–13, 227–231, 231 Q68–77
• Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields.	**Online:** Applying Practices: *Modeling Electrostatic Forces—The Early Atom* Applying Practices: *Modeling Electrostatic Forces—Ionic and Metallic Bonding* Applying Practices: *Modeling Electrostatic Forces—Covalent Bonding* STEM Unit Project 2 **Student Edition:** 83–90, 178–179, 179 Q12–18, 197–198, 203–204, 204 Q7–13, 227–231, 231 Q68–77
CCC Crosscutting Concepts	
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.	**Online:** *Science and Engineering Practices Handbook*

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CCSS Mathematics	
MP.2, MP.4, N-Q.1–3, A-SSE.1.a-b, A-SSE.3.a-c	**Online:** Applying Practices: *Modeling Electrostatic Forces—The Early Atom* Applying Practices: *Modeling Electrostatic Forces—Ionic and Metallic Bonding* Applying Practices: *Modeling Electrostatic Forces—Covalent Bonding* STEM Unit Project 1 STEM Unit Project 2

HS-PS2	**Motion and Stability: Forces and Interactions**	
HS-PS2–6.	**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.]*	**Online:** Applying Practices: *Touching the Future* and *Communicate Information About Contact and Noncontact Forces* STEM Unit Project 1 STEM Unit Project 3
SEP Science and Engineering Practices		
Obtaining, Evaluating, and Communicating Information • 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:** *Science and Engineering Practices Handbook:* Practice 8
DCI Disciplinary Core Ideas		
PS2.B: 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.		**Student Edition:** 168–172; p172 Q2; 173–179; 179 Q14 and Q15; 187–190; 190 Q41 and Q45; 196–198; 203–204, 211–219; 218 Get It?; 220–224; 222 Get It?; 224 Q61, Q63, Q64; 225–231; 226 Get It?; 227 Get It?; 229 Get It?; 230 Get It?; 231 Q68, Q72–Q77; 354–358; 361–364; 365–369; 411; 426–435; 427 Get It?; 435 Q41; 638 Get It?; 640–643; 645–649; 741–742;742 Q4; 746–750; 747 Get It?; 751–754; 752 Get It?; 754 Q25

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CCC Crosscutting Concepts	
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.	**Online:** *Science and Engineering Practices Handbook*
CCSS Mathematics	
N-Q.1–3	**Online:** Applying Practices: *Touching the Future* and *Communicate Information About Contact and Noncontact Forces* STEM Unit Project 1 STEM Unit Project 3
CCSS ELA/Literacy	
RST.11–12.1, WHST.9–12.2.a–e	**Online:** Applying Practices: *Touching the Future* and *Communicate Information About Contact and Noncontact Forces* STEM Unit Project 1 STEM Unit Project 3

HS-PS3	Energy	
HS-PS3–1.	**Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.** *[Clarification Statement: Emphasis is on explaining the meaning of mathematical expressions used in the model.] [Assessment Boundary: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.]*	**Online:** Applying Practices: *Modeling Changes in Energy* STEM Unit Project 3
SEP Science and Engineering Practices		
Using Mathematics and Computational Thinking • Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.		**Online:** *Science and Engineering Practices Handbook:* Practice 5

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DCI Disciplinary Core Ideas	
PS3.A: Definitions of Energy • Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms.	**Student Edition:** 448–450, 456–462
PS3.B: Conservation of Energy and Energy Transfer • Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system.	**Student Edition:** 448–450
• Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.	**Student Edition:** 448–450, 456–462
• Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior.	**Student Edition:** 448–450, 456–462
• The availability of energy limits what can occur in any system.	**Student Edition:** 448–450, 456–462
CCC Crosscutting Concepts	
Systems and System Models • Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models.	**Online:** *Science and Engineering Practices Handbook* **Student Edition:** 9
Connections to Nature of Science **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Science assumes the universe is a vast single system in which basic laws are consistent.	**Online:** *Science and Engineering Practices Handbook* **Student Edition:** 9
CCSS Mathematics	
MP.2, MP.4, N-Q.1–3	**Online:** Applying Practices: *Modeling Changes in Energy* STEM Unit Project 3
CCSS ELA/Literacy	
SL.11–12.5	**Online:** Applying Practices: *Modeling Changes in Energy* STEM Unit Project 3

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HS-PS3	Energy	
HS-PS3–2.	**Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and energy associated with the relative position of particles (objects).** *[Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.]*	**Online:** Applying Practices: *Modeling Energy at Different Scales* Applying Practices: *Develop and Use Models for Energy* STEM Unit Project 3
SEP Science and Engineering Practices		
Developing and Using Models • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.		**Online:** *Science and Engineering Practices Handbook:* Practice 2
DCI Disciplinary Core Ideas		
PS3.A: Definitions of Energy • Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms.		**Student Edition:** 448–450, 450 Get It? 455 Q7, 459–462, 462 Q16–22
• At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.		**Student Edition:** 448–450, 459–462, 633–643
• These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space.		**Student Edition:** 49–51, 344–345, 448–450, 459–462, 462 Q16–22, 624–625
CCC Crosscutting Concepts		
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.		**Student Edition:** 449
• Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems.		**Online:** *Science and Engineering Practices Handbook*

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CCSS Mathematics	
MP.2, MP.4	**Online:** Applying Practices: *Modeling Energy at Different Scales* Applying Practices: *Develop and Use Models for Energy* STEM Unit Project 3
CCSS ELA/Literacy	
SL.11–12.5	**Online:** Applying Practices: *Modeling Energy at Different Scales* Applying Practices: *Develop and Use Models for Energy* STEM Unit Project 3

HS-PS3	**Energy**	
HS-PS3–4.	**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 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.]*	**Online:** Applying Practices: *Coffee Cup Calorimetry* STEM Unit Project 3
SEP Science and Engineering Practices		
Planning and Carrying Out Investigations • 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:** *Science and Engineering Practices Handbook:* Practice 3
DCI Disciplinary Core Ideas		
PS3.B: 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.		**Student Edition:** 448–455, 455 Q7, 456–462, 755–758, 758 Get It?
• 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).		**Student Edition:** 196–198; 456–462; 477–485; 485 Q48, Q49, Q50; 771–772

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PS3.D: Energy in Chemical Processes • Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment.	**Student Edition:** 448–450, 450 Get It?, 456–462
CCC Crosscutting Concepts	
Systems 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.	**Online:** *Science and Engineering Practices Handbook*
CCSS Mathematics	
MP.2, MP.4	**Online:** Applying Practices: *Coffee Cup Calorimetry* STEM Unit Project 3
CCSS ELA/Literacy	
RST.11–12.1, WHST.9–12.7, WHST.11–12.8, WHST.9–12.9	**Online:** Applying Practices: *Coffee Cup Calorimetry* STEM Unit Project 3

HS-PS3	Energy	
HS-PS3–5.	**Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.** *[Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.] [Assessment Boundary: Assessment is limited to systems containing two objects.]*	**Online:** Applying Practices: *Modeling Electrostatic Forces--The Early Atom* Applying Practices: *Modeling Electrostatic Forces--Ionic and Metallic Bonding* Applying Practices: *Modeling Electrostatic Forces--Covalent Bonding* STEM Unit Project 1 STEM Unit Project 2
SEP Science and Engineering Practices		
Developing and Using Models • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.		**Online:** *Science and Engineering Practices Handbook: Practice 8*

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DCI Disciplinary Core Ideas	
PS3.C: Relationship Between Energy and Forces • When two objects interacting through a field change relative position, the energy stored in the field is changed.	**Online:** Applying Practices: *Modeling Electrostatic Forces--The Early Atom* Applying Practices: *Modeling Electrostatic Forces--Ionic and Metallic Bonding* Applying Practices: *Modeling Electrostatic Forces--Covalent Bonding* STEM Unit Project 1 STEM Unit Project 2 **Student Edition:** 83–90, 178–179, 179 Q12–18, 197–198, 203–204, 204 Q7–13, 227–231, 231 Q68–77
CCC Crosscutting Concepts	
Cause and Effect • Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.	**Online:** *Science and Engineering Practices Handbook*
CCSS Mathematics	
MP.2, MP.4	**Online:** Applying Practices: *Modeling Electrostatic Forces--The Early Atom* Applying Practices: *Modeling Electrostatic Forces--Ionic and Metallic Bonding* Applying Practices: *Modeling Electrostatic Forces--Covalent Bonding* STEM Unit Project 1 STEM Unit Project 2

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CCSS ELA/Literacy	
WHST.9–12.7, WHST.11–12.8, WHST.9–12.9, SL.11–12.5	**Online:** Applying Practices: *Modeling Electrostatic Forces--The Early Atom* Applying Practices: *Modeling Electrostatic Forces--Ionic and Metallic Bonding* Applying Practices: *Modeling Electrostatic Forces--Covalent Bonding* STEM Unit Project 1 STEM Unit Project 2

HS-PS4	Waves and Their Applications in Technologies for Information Transfer	
HS-PS4–1.	**Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.** *[Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.]*	**Online:** Applying Practices: *Wave Characteristics* STEM Unit Project 1
SEP Science and Engineering Practices		
Using Mathematics and Computational Thinking • Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.		**Online:** *Science and Engineering Practices Handbook:* Practice 5
DCI Disciplinary Core Ideas		
PS4.A: 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.		**Student Edition:** 107–110, 109 Get It?, 115
CCC Crosscutting Concepts		
Cause and Effect • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.		**Online:** *Science and Engineering Practices Handbook* **Student Edition:** 9

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CCSS Mathematics	
MP.2, MP.4, A-SSE.1.a,b, A-SSE.3.a-c, A.CED.4	**Online:** Applying Practices: *Wave Characteristics* STEM Unit Project 1
CCSS ELA/Literacy	
RST.11–12.7	**Online:** Applying Practices: *Wave Characteristics* STEM Unit Project 1

HS-PS4	**Waves and Their Applications in Technologies for Information Transfer**	
HS-PS4–3.	**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.]*	**Online:** Applying Practices: *Is light a wave or a particle? and Describe Types of Wave Interference* STEM Unit Project 1

SEP Science and Engineering Practices	
Engaging in Argument from Evidence • Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.	**Online:** *Science and Engineering Practices Handbook:* Practice 7
Connections to Nature of Science **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** • A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence.	**Online:** *Science and Engineering Practices Handbook:* Practice 6

DCI Disciplinary Core Ideas	
PS4.A: Wave Properties • [From the 3–5 grade band endpoints] 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.)	**Online:** Applying Practices: *Describe Types of Wave Interference*

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PS4.B: 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.	**Student Edition:** 106–115, 113 Q5–Q7, 115 Q8, 116–125
CCC Crosscutting Concepts	
Systems and System Model • 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.	**Online:** *Science and Engineering Practices Handbook* **Student Edition:** 9
CCSS Mathematics	
MP.2, A-SSE.1.a,b, A-SSE.3.a-c, A.CED.4	**Online:** Applying Practices: *Is light a wave or a particle? and Describe Types of Wave Interference* STEM Unit Project 1
CCSS ELA/Literacy	
RST.11–12.1, RST.9–10.8, RST.11–12.8	**Online:** Applying Practices: *Is light a wave or a particle? and Describe Types of Wave Interference* STEM Unit Project 1

HS-PS4	**Waves and Their Applications in Technologies for Information Transfer**	
HS-PS4–4.	**Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.** *[Clarification Statement: Emphasis is on the idea that photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.] [Assessment Boundary: Assessment is limited to qualitative descriptions.]*	**Online:** Applying Practices: *Human Health and Radiation Frequency* and *Evaluate the Effects of Electromagnetic Radiation on Matter* STEM Unit Project 1
SEP Science and Engineering Practices		
Obtaining, Evaluating, and Communicating Information • Evaluate the validity and reliability of multiple claims that appear in scientific and technical texts or media reports, verifying the data when possible.		**Online:** *Science and Engineering Practices Handbook:* Practice 8

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DCI Disciplinary Core Ideas	
PS4.B: Electromagnetic Radiation • When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells.	**Online:** Applying Practices: *Evaluate the Effects of Electromagnetic Radiation on Matter* **Student Edition:** 110, 110 Q2, 796–798
CCC Crosscutting Concepts	
Cause and Effect • Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.	**Online:** *Science and Engineering Practices Handbook* **Student Edition:** 9
CCSS ELA/Literacy	
RST.11–12.1, RST.11–12.7, RST.9–10.8, WHST.11–12.8	**Online:** Applying Practices: *Human Health and Radiation Frequency* and *Evaluate the Effects of Electromagnetic Radiation on Matter* STEM Unit Project 1

HS-ETS1	Engineering Design	
HS-ETS1–1.	**Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.**	**Online:** Applying Practices: *Engineer a Better World: Analyze a Major Global Challenge* STEM Unit Project 3 STEM Unit Project 5
SEP Science and Engineering Practices		
Asking Questions and Defining Problems • Analyze complex real-world problems by specifying criteria and constraints for successful solutions.		**Online:** *Science and Engineering Practices Handbook:* Practice 1

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DCI Disciplinary Core Ideas	
ETS1.A: Defining and Delimiting Engineering Problems • 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.	**Online:** Applying Practices: *Engineer a Better World: Analyze a Major Global Challenge* *Science and Engineering Practices Handbook:* Practice 1, Practice 6
• Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.	**Online:** Applying Practices: *Engineer a Better World: Analyze a Major Global Challenge* *Science and Engineering Practices Handbook:* Introduction, All Practices
CCC Crosscutting Concepts	
Connections to Engineering, Technology, and Applications of Science **Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.	**Online:** *Science and Engineering Practices Handbook* **Student Edition:** 5–6, 73, 133, 232

HS-ETS1	Engineering Design	
HS-ETS1–2.	**Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**	**Online:** Applying Practices: *Engineer a Better World: Design a Solution* STEM Unit Project 3 STEM Unit Project 4 STEM Unit Project 5
SEP Science and Engineering Practices		
Constructing Explanations and Designing Solutions • Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.		**Online:** *Science and Engineering Practices Handbook:* Practice 6

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DCI Disciplinary Core Ideas	
ETS1.C: 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 criteria over others (trade-offs) may be needed.	**Online:** Applying Practices: *Engineer a Better World: Design a Solution* *Science and Engineering Practices Handbook:* Practice 1, Practice 6

HS-ETS1	Engineering Design	
HS-ETS1–3.	**Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.**	**Online:** Applying Practices: *Engineer a Better World: Evaluate a Solution* STEM Unit Project 3 STEM Unit Project 4 STEM Unit Project 5
SEP Science and Engineering Practices		
Constructing Explanations and Designing Solutions • Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.		**Online:** *Science and Engineering Practices Handbook:* Practice 6
DCI Disciplinary Core Ideas		
ETS1.B: Developing Possible Solutions • When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.		**Online:** Applying Practices: *Engineer a Better World: Evaluate a Solution* *Science and Engineering Practices Handbook:* Practice 1, Practice 6
CCC Crosscutting Concepts		
Connections to Engineering, Technology, and Applications of Science **Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.		**Online:** *Science and Engineering Practices Handbook* **Student Edition:** 5–6, 73, 133, 232

<table>
<tr><th>HS-ETS1</th><th colspan="2">Engineering Design</th></tr>
<tr><td>HS-ETS1–4.</td><td>Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.</td><td>Online:
Applying Practices: Engineer a Better World: Use a Computer Simulation

STEM Unit Project 3
STEM Unit Project 5</td></tr>
<tr><td colspan="3">SEP Science and Engineering Practices</td></tr>
<tr><td colspan="2">Using Mathematics and Computational Thinking
• Use mathematical models and/or computer simulations to predict the effects of a design solution on systems and/or the interactions between systems.</td><td>Online:
Science and Engineering Practices Handbook: Practice 5</td></tr>
<tr><td colspan="3">DCI Disciplinary Core Ideas</td></tr>
<tr><td colspan="2">ETS1.B: Developing Possible Solutions
• Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.</td><td>Online:
Applying Practices: Engineer a Better World: Use a Computer Simulation

Science and Engineering Practices Handbook: Practice 2, Practice 5, Practice 6</td></tr>
<tr><td colspan="3">CCC Crosscutting Concepts</td></tr>
<tr><td colspan="2">Systems and System Models
• 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.</td><td>Online:
Science and Engineering Practices Handbook

Student Edition: 9</td></tr>
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HS-ESS2	Earth's Systems	
HS-ESS2-2	**Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth's systems.** *[Clarification Statement: Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.]*	**Online:** Applying Practices: *Analyze Geoscience Data—Ocean Acidification* Applying Practices: *Analyze and Model Geoscience Data—Climate Change* STEM Unit Project 3 STEM Unit Project 5
HS-ESS2-3	**Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.** *[Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.]*	**Online:** Applying Practices: *The Cycling of Matter through Thermal Convection* STEM Unit Project 1
HS-ESS2-4	**Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.** *[Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.] [Assessment Boundary: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.]*	**Online:** Applying Practices: *Analyze Geoscience Data—Ocean Acidification* Applying Practices: *Analyze and Model Geoscience Data—Climate Change* STEM Unit Project 3 STEM Unit Project 5 Interactive Content placed at Units 3 and 5
HS-ESS2-6	**Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.** *[Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.]*	**Online:** Applying Practices: *Carbon Cycling Through Earth's Spheres* STEM Unit Project 3 STEM Unit Project 5 Interactive Content placed at Units 3 and 5

HS-ESS3	Earth and Human Activity	
HS-ESS3-2	**Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.*** *[Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen.]*	**Online:** Applying Practices: *Environmental Consulting: Finding Solutions* STEM Unit Project 3 STEM Unit Project 5 Interactive Content placed at Unit 5
HS-ESS3-4	**Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*** *[Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).]*	**Online:** Applying Practices: *Batteries—Reduce, Reuse, Recycle, Recover*
HS-ESS3-5	**Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.** *[Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]*	**Online:** Applying Practices: *Forecasting Climate Change* STEM Unit Project 3 STEM Unit Project 5 Interactive Content placed at Unit 3
HS-ESS3-6	**Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.** *[Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.] [Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.]*	**Online:** Applying Practices: *Exploring Relationships: Climate Change and Human Activity* STEM Unit Project 3 STEM Unit Project 5 Interactive Content placed at Unit 3