IQWST Alignment to the South Carolina College-and-Career-Ready Science Standards 2021 Grades 6-8

The page numbers listed represent each section in which students are being prepared to meet the *South Carolina College-and-Career-Ready Science Standards 2021*.

Activate Learning

Engaged Students. Passionate Teachers.

6th Grade

Key: A=Lesson, L=Lesson, R=Reading, AL=Appendix Lesson

South Carolina Performance Expectation (PE) and Disciplinary Core Ideas (DCI)	IQWST Unit/Lesson/Activity
Matter and Its Interactions (PS1)	
6-PS1-4. Develop and use a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.	
PS1.A Structure and Properties of Matter ● Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.	**Earth Science 2:** **Lesson 2:** A2.2, L2R1, **Lesson 3:** A3.1, H3.1, A3.2 **Introduction to Chemistry 1:** **Lesson 1:** A1.1, L1R1, A1.2, L1R2, **Lesson 2:** A2.1, L2R1, A2.2, A2.3, L2R2, **Lesson 3:** A3.1, L3R1, A3.2, L3R2, **Lesson 4:** A4.1, L4R1, **Lesson 5:** A5.1, A5.2, L5R1, A5.3, **Lesson 6:** A6.1, A6.2, **Lesson 9:** A9.2, **Lesson 11:** A11.1, A11.2, L11R1, **Lesson 12:** A12.1, L12R1, A12.2, **Lesson 13:** A13.1, L13R1, A13.2, A13.3, L13R1, A13.4, L13R2, **Lesson 14:** A14.1, L14R1, A14.2, L14R2, **Lesson 15:** A15.1, L15R1, A15.2, L15R2, **Lesson 16:** L16R1, A16.2
PS1.A Structure and Properties of Matter ● In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.	**Earth Science 2:** **Lesson 2:** A2.2, L2R1, **Lesson 3:** A3.1, H3.1, A3.2 **Introduction to Chemistry 1:** **Lesson 4:** A4.1, L4R1, **Lesson 5:** A5.1, A5.2, L5R1, **Lesson 6:** A6.1, A6.2, **Lesson 9:** A9.2, **Lesson 11:** A11.1, A11.2, L11R1, **Lesson 12:** L12R1, A12.1, A12.2, **Lesson 13:** A13.1, L13R1, A13.2, A13.3, L13R1, A13.4, L13R2, **Lesson 14:** A14.1, L14R1, A14.2, L14R2, **Lesson 15:** A15.1, L15R1, A15.2, L15R2, **Lesson 16:** L16R1, A16.2
PS1.A Structure and Properties of Matter ● The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.	**Earth Science 2:** **Lesson 2:** A2.2, L2R1, **Lesson 3:** A3.1, H3.1, A3.2 **Introduction to Chemistry 1:** **Lesson 3:** A3.1, L3R1, A3.2, L3R2, **Lesson 11:** A11.1, A11.2, L11R1, **Lesson 12:** L12R1, A12.1, A12.2, **Lesson 13:** A13.1, L13R1, A13.2, A13.3, L13R1, A13.4, L13R2, **Lesson 14:** A14.1, L14R1, A14.2, L14R2, **Lesson 15:** A15.1, L15R1, A15.2, L15R2, **Lesson 16:** L16R1, A16.2
PS3.A: Definitions of Energy ● The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from object to another. In science, heat is used only or this second meaning; it refers to the energy transferred due to the temperature difference between two objects.	**Earth Science 2:** **Lesson 2:** A2.2, L2R1, **Lesson 3:** A3.1, H3.1, A3.2 **Introduction to Chemistry 1:** **Lesson 3**A3.1, L3R1, A3.2, L3R2, **Lesson 4:** A4.1, L4R1, **Lesson 11:** A11.1, A11.2, L11R1, **Lesson 12:** A12.1, L12R1, A12.2, **Lesson 13:** A13.1, L13R1, A13.2, A13.3, L13R1, A13.4, L13R2, **Lesson 14:** A14.1, L14R1, A14.2, L14R2, **Lesson 15:** A15.1, L15R1, A15.2, L15R2, **Lesson 16:** L16R1

PS3.A: Definitions of Energy ● The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material.	**Earth Science 2:** **Lesson 2:** A2.2, L2R1, **Lesson 3:** A3.1, H3.1, A3.2 **Introduction to Chemistry 1:** **Lesson 11:** A11.1, A11.2, L11R1, **Lesson 15:** A15.1, L15R1
PS3.A: Definitions of Energy ● Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material.	**Earth Science 2:** **Lesson 2:** A2.2, L2R1, **Lesson 3:** A3.1, H3.1, A3.2 **Introduction to Chemistry 1:** **Lesson 11:** A11.1, A11.2, L11R1, **Lesson 15:** A15.1, L15R1
Energy (PS3)	
6-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.	
PS3.A: Definitions of Energy ● The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and energy transfers by convection, conduction, and radiation (particularly infrared and light).	**Earth Science 2:** **Lesson 2:** A2.2, L2R1, **Lesson 3:** A3.1, H3.1, A3.2 **Introduction to Chemistry 1:** **Lesson 3**A3.1, L3R1, A3.2, L3R2, **Lesson 4:** A4.1, L4R1, **Lesson 11:** A11.1, A11.2, L11R1, **Lesson 12:** A12.1, L12R1, A12.2, **Lesson 13:** A13.1, L13R1, A13.2, A13.3, L13R1, A13.4, L13R2, **Lesson 14:** A14.1, L14R1, A14.2, L14R2, **Lesson 15:** A15.1, L15R1, A15.2, L15R2, **Lesson 16:** L16R1
PS3.B: Conservation of Energy and Energy ● The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment.	**Introduction to Chemistry 1:** **Lesson 12:** A12.1, L12R1, **Lesson 13:** A13.4, L13R2, **Lesson 15:** A15.1, L15R1, A15.2, L15R2
PS3.B Conservation of Energy and Energy Transfer ● Energy is spontaneously transferred out of hotter regions or objects and into colder ones by the processes of conduction, convection, and radiation.	**Earth Science 2:** **Lesson 2:** A2.2, L2R1, **Lesson 3:** A3.1, H3.1, A3.2 **Introduction to Chemistry 1:** **Lesson 11:** A11.1, **Lesson 12:** A12.1, **Lesson 13:** A13.1, L13R1, A13.2, A13.4, L13R2, **Lesson 15:** A15.1, L15R1, A15.2, L15R2, **Lesson 16:** L16R1, A16.2
ETS1.A Defining and Delimiting Engineering Problems ● The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions.	**Earth Science 2:** Appendix Lesson 3: A3.1, L3R1 **Earth Science 3:** **Appendix Lesson 1:** A1.1, AL1R1
ETS1.B: Developing Possible Solutions ● A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem.	**Earth Science 2:** Appendix Lesson 3: A3.1, L3R1 **Earth Science 3:** **Appendix Lesson 1:** A1.1, AL1R1

6-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.	
PS3.A Definitions of Energy ● Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.	**Introduction to Chemistry 1: Lesson 11:** A11.1, **Lesson 12:** A12.1, L12R1, A12.2, **Lesson 13:** A13.1, L13R1, A13.2, A13.3, L13R1, A13.4, L13R2, **Lesson 14:** A14.1, L14R1, A14.2, L14R2, **Lesson 15:** A15.1, L15R1, A15.2, L15R2, **Lesson 16:** L16R1, A16.2
PS3.B Conservation of Energy and Energy Transfer ● The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment.	**Introduction to Chemistry 1:** **Lesson 12:** A12.1, L12R1, **Lesson 13:** A13.4, L13R2, **Lesson 15:** A15.1, L15R1, A15.2, L15R2
Waves and Their Applications in Technologies for Information Transfer (PS4)	
6-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	
PS4.A Wave Properties ● A sound wave needs a medium through which it is transmitted.	**This Standard will be addressed in 8th grade in the Unit:** **Can I Believe My Eyes?**
PS4.B Electromagnetic Radiation ● When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light.	**Earth Science 2:** **Lesson 2:** A2.1, **Lesson 7:** A7.1, **Appendix Lesson 1:** A1.2, AL1R1 **This Standard is also be addressed in 8th grade in the Unit:** **Can I Believe My Eyes?**
PS4.B Electromagnetic Radiation ● The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends**.**	**This Standard will be addressed in 8th grade in the Unit:** **Can I Believe My Eyes?**
PS4.B Electromagnetic Radiation ● A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media.	**Introduction to Chemistry 1:** **Lesson A7.1, L7R1** **This Standard is also be addressed in 8th grade in the Unit:** **Can I Believe My Eyes?**
PS4.B Electromagnetic Radiation ● However, because light can travel through space, it cannot be a matter wave, like sound or water waves.	**This Standard will be addressed in 8th grade in the Unit:** **Can I Believe My Eyes?**
From Molecules to Organisms: Structures and Processes (LS1)	

6-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.	
LS1.A: Structure and Function ● All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).	**Life Science 2:** **Lesson 1:** A1.1, L1R1, A1.1, A1.2, A1A.3, **Lesson 2:** A2.1, A2.2, A2.3, L2R1
ETS2.A: Interdependence of Science, Engineering, and Technology ● Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.	**Life Science 2:** **Lesson 1:** A1.1, L1R1, A1.1, A1.2, A1A.3, **Lesson 2:** A2.1, A2.2, A2.3, L2R1
6-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function. **6.1, 6.3**	**Life Science 2 - What is Going on Inside Me?**
LS1.A: Structure and Function ● Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.	**Life Science 2:** **Lesson 5:** A5.2, L5R1, A5.3, **Lesson 7:** A7.2
6-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. **6.1**	**Life Science 2 - What is Going on Inside Me?**
LS1.A: Structure and Function ● In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.	**Life Science 2:** **Lesson 3:** A3.1, L3R1, A3.2, **Lesson 4:** Intro to Lesson 4, A4.1, A4.2, A4.3, **Lesson 5:** A5.1**,** **Lesson 6:** A6.2, L6R1, **Lesson 7:** A7.1, L7R1, **Lesson 8:** A8.1, **Lesson 10:** A10.1, L10R1, **Lesson 11:** A11.1
6-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. **6.1**	**Life Science 2 - What is Going on Inside Me?** **Introduction to Chemistry 1 - How Can I Smell Things from a Distance?**
LS1.D Information Processing ● Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.	**Introduction to Chemistry 1:** **Lesson 1:** A1.1, L1R1, **Lesson 6:** L6R1 **Life Science 2:** **Lesson 10:** A10.1, L10R1
LS1.D Information Processing ● Changes in the structure and functioning of many millions of interconnected nerve cells allow combined inputs to be stored as memories for long periods of time.	**Life Science 2:** **Lesson 7:** A7.1, L7R1, **Lesson 10:** A10.1, L10R1
Earth's Place in the Universe (ESS1)	

6-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.	
ESS1.C: The History of Planet Earth ● The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.	**Earth Science 3:** **Lesson 2:** A2.1, L2R1, A2.2**, Appendix Lesson 2:** A2.1, A2.2, AL2R1
ESS1.C: The History of Planet Earth ● Major historical events include the formation of mountain chains and ocean basins, the adaptation and extinction of particular living organisms, volcanic eruptions, periods of massive glaciation, and development of watersheds and rivers through glaciation and water erosion.	**Earth Science 3:** **Lesson 2:** A2.1, L2R1, A2.2**, Appendix Lesson 2:** A2.1, A2.2, AL2R1
Earth's Systems (ESS2)	
6-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.	
ESS2.A: Earth's Materials and Systems ● All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.	**Earth Science 2:** **Appendix Lesson 1:** A1.1, A1.2 **Earth Science 3:** **Lesson 2:** A2.2, **Lesson 4:** A4.1, A4.2, L4R1, **Lesson 5:** A5.2, **Lesson 6:** A6.1, **Lesson 8:** A8.1, L8R1, **Lesson 9:** A9.3, **Lesson 10:** A10.3
6-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.	**Earth Science 3 – How is the Earth Changing?**
ESS2.A: Earth's Materials and Systems ● The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.	**Earth Science 3:** **Lesson 1:** A1.1, A1.2, L1R1, A1.3, **Lesson 5:** A5.1, L5R1, **Lesson 6:** A6.1, A6.2, L6R1, **Lesson 9:** A9.3, **Lesson 10:** A10.1, L10R1, A10.2, A10.3
ESS2.C: The Roles of Water in Earth's Surface Processes ● Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.	**Earth Science 3:** **Lesson 6:** A6.2, L6R1, **Lesson 10:** A10.1, L10R1, A10.2, A10.3
6-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.	**Earth Science 3 – How is the Earth Changing?**
ESS2.B: Plate Tectonics and Large-Scale System Interactions ● Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geological history.	**Earth Science 3:** **Lesson 2:** A2.1, L2R1, A2.2, **Lesson 3:** A3.1, **Lesson 7:** A7.1, **Lesson 9:** A9.1, L9R1, A9.2, **Lesson 10:** A10.1, L10R1, A10.2, A10.3

ESS2.B: Plate Tectonics and Large-Scale System Interactions ● Plate movements are responsible for most continental and ocean floor features and for the distribution of most rocks and minerals within Earth's crust.	**Earth Science 3:** **Lesson 2:** A2.1, L2R1, A2.2, **Lesson 3:** A3.1, **Lesson 7:** A7.1, **Lesson 9:** A9.1, L9R1, A9.2, **Lesson 10:** A10.1, L10R1, A10.2, A10.3
ESS2.B: Plate Tectonics and Large-Scale System Interactions ● Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.	**Earth Science 3:** **Lesson 2:** A2.1, L2R1, **Lesson 3:** A3.1, **Lesson 7:** A7.1, **Lesson 9:** A9.2, **Lesson 10:** A10.1, L10R1, A10.2, A10.3
ETS2.A: Interdependence of Science, Engineering, and Technology ● Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.	**Earth Science 3:** **Lesson 1:** L1R1, **Lesson 8:** A8.1
6-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. **6.2, 6.3**	
ESS2.C: The Roles of Water in Earth's Surface Processes ● Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.	**Introduction to Chemistry 1:** **Lesson 15:** L15R2 **Earth Science 2:** **Lesson 1:** A1.2, L1R1, **Lesson 4:** A4.3
ESS2.C: The Roles of Water in Earth's Surface Processes ● Global movements of water and its changes in form are propelled by sunlight and gravity.	**Earth Science 2:** **Lesson 1:** A1.2, L1R1, **Lesson 4:** A4.1, A4.2,
6-ESS2-5. Analyze and interpret data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions. **6.2**	
ESS2.C: The Roles of Water in Earth's Surface Processes ● The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.	**Earth Science 2:** **Lesson 1:** A1.2, L1R1, **Lesson 2:** A2.1, **Lesson 4:** A4.1, A4.2, **Lesson 5:** A5.1, L5R1, A5.2, **Lesson 6:** A6.1, A6.2, L6R1
ESS2.D: Weather and Climate ● Because these patterns are so complex, weather can only be predicted probabilistically.	**Earth Science 2:** **Lesson 1:** A1.2, L1R1, **Lesson 2:** A2.1, **Lesson 5:** A5.1, A5.2, **Lesson 6:** A6.1, A6.2, L6R1
6-ESS2-6. Develop and use models to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. **6.2**	
ESS2.C: The Roles of Water in Earth's Surface Processes ● Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.	**Earth Science 2:** L4R1

ESS2.D: Weather and Climate ● The tilt of the earth's rotational axis causes a pattern of uneven heating and cooling that changes seasonally and establishes global patterns of climate and weather.	**Earth Science 2:** **Lesson 7:** A7.3, A7.4, A7.5, **Lesson 8:** A8.2, L8R1, 8.3, L8R2, A8.4
ESS2.D: Weather and Climate ● Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.	**Earth Science 2:** **Lesson 1:** A1.1, **Lesson 3:** A3.3, L3R1, **Lesson 7:** A7.1, A7.2, A7.5, **Lesson 8:** A8.1, A8.2, L8R1
ESS2.D: Weather and Climate ● The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.	**Earth Science 2:** L4R1
Earth and Human Activity (ESS3)	
6-ESS3-2. Analyze and interpret data on natural hazards to identify patterns which help forecast future catastrophic events and inform the development of technologies to mitigate their effects.	
ESS3.B: Natural Hazards ● Some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable.	**Earth Science 3:** **Lesson 1:** A1.1, A1.2, L1R1, **Lesson 6:** A6.2, L6R1, **Lesson 9:** L9R2, **Appendix Lesson 1:** A1.1, AL1R1
ESS3.B: Natural Hazards ● Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events.	**Earth Science 3:** **Lesson 1:** A1.1, A1.2, L1R1, **Lesson 6:** A6.2, L6R1, **Lesson 9:** L9R2, **Appendix Lesson 1:** A1.1, AL1R1
ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World ● The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.	**Earth Science 3:** **Appendix Lesson 1:** A1.1, AL1R1

IQWST 3.0 South Carolina Alignment

7th Grade

Key: A=Lesson, L=Lesson, R=Reading, AL=Appendix Lesson

South Carolina Performance Expectation and Disciplinary Core Ideas	
Matter and Its Interactions (PS1)	
7-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.	
PS1.A Structure and Properties of Matter ● Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.	**Introduction to Chemistry 2:** **Lesson 3: L**3R1, **Lesson 7:** A7.1, L7R1, **Lesson 8:** A8.2, L8R2, A8.3, L8R3, **Lesson 9:** A9.1, L9R1, **Lesson 10:** 10R1, **Lesson 12:** A12.1a, L12R2 **Introduction to Chemistry 3:** **Lesson 3:** A3.1, L3RR1, A3.2, L3R2
PS1.A Structure and Properties of Matter ● Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).	**Introduction to Chemistry 3:** **Lesson 3:** A3.1, R1, A3.2, 33R2
7-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	**?**
PS1.A Structure and Properties of Matter ● Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.	**Physical Science 2:** **Lesson 8:** L8R1 **Introduction to Chemistry 2:** **Lesson 1:** A1.1, A1.2**,** L1R2, A1.3, **Lesson 2**: A2.1, L2R1, A2.2, **Lesson 3:** A3.1, L3R1 , A3.2, L3R2, **Lesson 4:** A4.1, L4R1, A4.2, **Lesson 5:** A5.1, L5R1, **Lesson 6**: A6.1, L6R1, L6R2, **Lesson 7:** A7.1, L7R1, **Lesson 8:** A8.1, L8R1, A8.2, L8R2, A8.3, L8R3, **Lesson 9:** A9.1, **Lesson 10:** A10.1, L10R1, **Lesson 11:** A11.1, L11R1, A11.2, **Lesson 12:** A12.1a, **Lesson 13:** A13.1, L13R1, Lesson 14: A14.1, L14R1, A14.2, **Appendix Lesson 1:** A1.1, AL1R1, **Appendix Lesson 2:** A2.1, AL2R1 **Introduction to Chemistry 3:** **Lesson 1:** A1.1
PS1.B Chemical Reactions ● Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.	**Physical Science 2:** **Lesson 8:** L8R1 **Introduction to Chemistry 2:** **Lesson 1:** A1.1, L1R1, A1.2, L1R2, A1.3, **Lesson 2:** A2.1, L2R1, A2.2, **Lesson 3:** A3.1, L3R1, A3.2, L3R2, **Lesson 4:** A4.2, , L4R1, A4.2, **Lesson 5:** A5.1, L5R1, **Lesson 6:** A6.1, L6R1, L6R2, **Lesson 7;** A7.1, L7R1, **Lesson 8:** A8.1, L8R1, A8.2, L8R2, A8.3, L8R3, **Lesson 9:** A9.1, **Lesson 10:** A10.1, L10R1, **Lesson 11:** A11.1, L11R1, A11.2, **Lesson 12:** A12.1a, A12.1, L12R1, A12.2, L12R2, **Lesson 13:** A13.1, L13R1, **Lesson 14:** A14.1, L14R1, A14.2, **Appendix Lesson 1**: A1.1, AL1R1
7-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	

PS1.A Structure and Properties of Matter ● Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.	**Physical Science 2:** **Lesson 8:** L8R1 **Introduction to Chemistry 2:** **Lesson 1:** L1R1, **Lesson 7:** L7R1, L11R1, **Appendix Lesson 1:** A1.1, AL1R1, **Appendix Lesson 2:** A2.1, AL2R1 **Introduction to Chemistry 3:** **Lesson 1:** A1.1
PS1.B Chemical Reactions ● Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.	**Introduction to Chemistry 2:** **Lesson 1:** A1.1, L1R1, A1.2, L1R2, A1.3, **Lesson 2:** A2.1, L2R1, A2.2, **Lesson 3:** A3.1, L3R1, A3.2, L3R2, **Lesson 4:** A4.2, , L4R1, A4.2, **Lesson 5:** A5.1, L5R1, **Lesson 6:** A6.1, L6R1, **Lesson 7;** A7.1, L7R1, **Lesson 8:** A8.1, L8R1, A8.2, L8R2, A8.3, L8R3, **Lesson 9:** A9.1, **Lesson 10:** A10.1, L10R1, **Lesson 11:** A11.1, L11R1, A11.2, **Lesson 12:** A12.1a, A12.1, L12R1, A12.2, L12R2, **Lesson 13:** A13.1, L13R1, **Lesson 14:** A14.1, L14R1, A14.2, **Appendix Lesson 1**: A1.1, AL1R1
ETS2.A: Interdependence of Science, Engineering, and Technology ● Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems.	**Introduction to Chemistry 2:** **Lesson 11:** A11.1, L11R1, A11.2, **Lesson 12:** A12.1a, A12.1, L12R1, A12.2, L12R2, **Lesson 13:** A13.1, L13R1, **Lesson 14:** A14.1, L14R1, A14.2, **Appendix Lesson 1**: A1.1, AL1R1
ETS2.B: Influence of Science, Engineering and Technology on Society and the Natural World ● The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time.	**Introduction to Chemistry 2:** **Lesson 1:** L1R2, **Appendix Lesson 1**: A1.1, AL1R1, **Appendix Lesson 2:** A2.1, L2R1
7-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.	
PS1.B: Chemical Reactions ● Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.	**Introduction to Chemistry 2:** **Lesson 1:** A1.1, L1R1, A1.2, L1R2, A1.3, **Lesson 2:** A2.1, L2R1, A2.2, **Lesson 3:** A3.1, L3R1, A3.2, L3R2, **Lesson 4:** A4.2, , L4R1, A4.2, **Lesson 5:** A5.1, L5R1, **Lesson 6:** A6.1, L6R1, L6R2, **Lesson 7;** A7.1, L7R1, **Lesson 8:** A8.1, L8R1, A8.2, L8R2, A8.3, L8R3, **Lesson 9:** A9.1, **Lesson 10:** A10.1, L10R1, **Lesson 11:** A11.1, L11R1, A11.2, **Lesson 12:** A12.1a, A12.1, L12R1, A12.2, L12R2, **Lesson 13:** A13.1, L13R1, **Lesson 14:** A14.1, L14R1, A14.2, **Appendix Lesson 1**: A1.1, AL1R1
PS1.B: Chemical Reactions ● The total number of each type of atom is conserved, and thus the mass does not change.	**Introduction to Chemistry 2:** **Lesson 12:** A12.1a, A12.1, L12R1, A12.2, L12R2 **Introduction to Chemistry 3:** **Lesson 8:** A8.1
PS1.B: Chemical Reactions ● The total number of each type of atom is conserved, and thus the mass does not change. Some chemical reactions release energy, others store energy.	**Introduction to Chemistry 2:** **Lesson 12:** A12.1a, A12.1, L12R1, A12.2, L12R2; **Lesson 14:** A14.2 **Introduction to Chemistry 3:** **Lesson 8:** A8.1 **Physical Science 2:** **Lesson 8:** A8.1, A8.2, A8.3

7-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.	
PS1.B Chemical Reactions ● Some chemical reactions release energy, others store energy.	**Physical Science 2:** **Lesson 8:** A8.1, A8.2, A8.3 **Introduction to Chemistry 2:** **Lesson 14:** A14.2
ETS1.B: Developing Possible Solutions ● A solution needs to be tested, and then modified on the basis of the test results, in order to improve it**.**	**Physical Science 2:** **Appendix Lesson 1:** A1.1, AL1R1 **Introduction to Chemistry 2:** **Lesson 14:** A14.2
ETS1.C: Optimizing the Design Solution ● Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process —that is, some of the characteristics may be incorporated into the new design.	**Physical Science 2:** **Lesson 8:** A8.1, A8.2, A8.3**, Appendix Lesson 1:** A1.1, AL1R1 **Introduction to Chemistry 2:** **Lesson 14:** A14.2
ETS1.C: Optimizing the Design Solution ● The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.	**Physical Science 2:** **Appendix Lesson 1:** A1.1, AL1R1 **Introduction to Chemistry 2:** **Lesson 14:** A14.2
Energy (PS3)	
7-PS3-1. Construct and interpret graphical displays of data to describe the proportional relationships of kinetic energy to the mass of an object and to the speed of an object.	
PS3.A Definitions of Energy ● Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.	**Physical Science 2:** **Lesson 1:** A1.1, A1.2, L1R1, **Lesson 2:** A2.1, A2.2, L2R2, A2.3, **Lesson 3:** A3.1, **Lesson 8:** A8.4
7-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.	**Physical Science 2 - Why Do Some Things Stop While Others Keep Going?**
PS3.A Definitions of Energy ● A system of objects may also contain stored (potential) energy, depending on their relative positions**.**	**Physical Science 2:** **Lesson 3:** A3.2, A3.3, **Lesson 4:** A4.1, A4.3, L4R1, **Lesson 5:** A5.2, A5.3, A5.4, L5R1, **Lesson 6:** A6.1, L6R1, **Lesson 7:** A7.1, **Lesson 8:** A8.4
PS3.C Relationship Between Energy and Forces ● When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.	**Physical Science 2:** **Lesson 3:** A3.2, A3.3, **Lesson 4:** A4.1, A4.3, L4R1, **Lesson 5:** A5.2, A5.3, A5.4, L5R1, **Lesson 6:** A6.1, L6R1, **Lesson 7:** A7.1, **Lesson 8:** A8.4
7-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.	
PS3.B Conservation of Energy and Energy Transfer	**Physical Science 2:**

• When the motion energy of an object changes, there is inevitably some other change in energy at the same time.	**Lesson 3:** L3R1, A3.3, **Lesson 4:** A4.1, A4.2, A4.3, L4R1, **Lesson 5:** A5.1, A5.2, A5.3, A5.4, L5R1, **Lesson 6:** A6.1, **Lesson 9:** A9.1, **Lesson 10:** A10.1, **Lesson 11:** A11.1, L11R1
From Molecules to Organisms: Structures and Processes (LS1)	
7-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	
LS1.C Organization for Matter and Energy in Flow in Organisms • Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.	**Introduction to Chemistry 3:** **Lesson 2:** A2.1, A2.2, L2R1, **Lesson 5:** L5R2B, **Lesson 6:** A6.1, L6R1, **Lesson 7:** A7.2, L7R2, A7.3 **Life Science 1:** **Lesson 4:** A4.2
LS1.C Organization for Matter and Energy in Flow in Organisms • Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. In most animals and plants, oxygen reacts with carbon- containing molecules (sugars) to provide energy and produce carbon dioxide; anaerobic bacteria achieve their energy needs in other chemical processes that do not require oxygen.	**Introduction to Chemistry 3:** **Lesson 1:** L1R1, A1.2, L1R2, **Lesson 2:** A2.2, L2R1, **Lesson 3:** A3.1, L3R1, A3.3, L3R3, **Lesson 4:** A4.1, L4R1, **Lesson 5:** A5.1, L5R1, A5.2, L5R2A, L5R2B, **Lesson 8:** L8R1, **Lesson 9:** A9.1, L9R1, A9.2, L9R2A, L9R2B, A9.3, L9R3, **Lesson 10:** A10.2, L10R2, A10.3, L10R3 **Life Science 1:** **Lesson 3:** A3.1, A3.2, A3.3, L3R1, A3.4
PS3.D Energy in Chemical Processes and Everyday Life • The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen.	**Introduction to Chemistry 3:** **Lesson 2:** A2.1, A2.2, L2R1, **Lesson 5:** L5R2B, **Lesson 6:** A6.1, L6R1, **Lesson 7:** A7.2, L7R2, A7.3 **Life Science 1:** **Lesson 4:** A4.2
7-LS1-7. Develop a model to describe how food molecules in plants and animals are rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.	
LS1.C Organization for Matter and Energy in Flow in Organisms • Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy.	**Introduction to Chemistry 3:** **Lesson 1:** L1R1, A1.2, L1R2, **Lesson 2:** A2.2, L2R1, **Lesson 3:** A3.1, L3R1, A3.3, L3R3, **Lesson 4:** A4.1, L4R1, **Lesson 5:** A5.1, L5R1, A5.2, L5R2A, L5R2B, **Lesson 8:** L8R1, **Lesson 9:** A9.1, L9R1, A9.2, L9R2A, L9R2B, A9.3, L9R3, **Lesson 10:** A10.2, L10R2, A10.3, L10R3 **Life Science 1:** **Lesson 3:** A3.1, A3.2, A3.3, L3R1, A3.4
PS3.D Energy in Chemical Processes and Everyday Life • Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.	**Introduction to Chemistry 3:** **Lesson 1:** L1R1, A1.2, L1R2, **Lesson 2:** A2.2, L2R1, **Lesson 3:** A3.1, L3R1, A3.3, L3R3, **Lesson 4:** A4.1, L4R1, **Lesson 5:** A5.1, L5R1, A5.2, L5R2A, L5R2B, **Lesson 8:** L8R1, **Lesson 9:** A9.1, L9R1, A9.2, L9R2A, L9R2B, A9.3, L9R3, **Lesson 10:** A10.2, L10R2, A10.3, L10R3 **Life Science 1:** **Lesson 3:** A3.1, A3.2, A3.3, L3R1, A3.4

Ecosystems: Interactions, Energy, and Dynamics (LS2)	
7-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	
LS2.A: Interdependent Relationships in Ecosystems ● Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.	**Life Science 1:** Lesson 2: A2.1, **Lesson 9:** A9.1, H9.2
LS2.A: Interdependent Relationships in Ecosystems ● In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.	**Life Science 1:** **Lesson 2:** A2.1, **Lesson 9:** A9.1, H9.2
LS2.A: Interdependent Relationships in Ecosystems ● Growth of organisms and population increases are limited by access to resources.	**Life Science 1:** **Lesson 2:** A2.1, **Lesson 9:** A9.1, H9.2
7-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	
LS2.A: Interdependent Relationships in Ecosystems ● Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.	**Life Science 1:** **Lesson 1:** A1.1, L1R1, A1.2, H1.2, A1.3, L1R2, **Lesson 6:** A6.1, L6R1, **Lesson 7:** A7.3, **Lesson 9:** A9.2, L9R1, A9.3, L9R2
7-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	
LS2.B Cycle of Matter and Energy Transfer in Ecosystems ● Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments.	**Introduction to Chemistry 3:** **Lesson 10:** A10.1, L10R1, A10.2, L10R2, A10.3, L10R3 **Life Science 1:** **Lesson 4:** A4.1, **Lesson 5:** A5.1, A5.2, **Lesson 6:** A6.2
LS2.B Cycle of Matter and Energy Transfer in Ecosystems ● The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.	**Introduction to Chemistry 3:** **Lesson 10:** A10.1, L10R1, A10.2, L10R2, A10.3, L10R3 **Life Science 1:** **Lesson 4:** A4.1, **Lesson 5:** A5.1, A5.2, **Lesson 6:** A6.2
7-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	

LS2.C Ecosystems Dynamics, Functioning and Resilience ● Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.	**Life Science 1:** **Lesson 2:** L2R1, **Lesson 5:** L5R1, A5.2, L5R2, **Lesson 9:** A9.3, L9R2, **Lesson 10:** A10.1, **Lesson 11:** A11.1, **Lesson 12:** A12.1, L12R1, **Lesson 13:** A13.1, A13.2
7-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	
LS2.C Ecosystem Dynamics, Functioning, and Resilience ● Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.	**Life Science 1:** **Lesson 1:** A1.1, L1R1, A1.3, L1R2, **Lesson 10:** L10R1
LS4.D Biodiversity and Humans ● Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on— for example, water purification and recycling.	**Life Science 1:** **Lesson 1:** A1.1, L1R1, A1.3, L1R2, **Lesson 10:** L10R1
ETS1.B ● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.	**Life Science 1:** **Lesson 10:** L10R1, **Appendix Lesson 1:** A1.1, AL1R1, AL1R2
ETS2.B: Influence of Science, Engineering and Technology on Society and the Natural World ● The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.	**Life Science 1:** **Lesson 10:** L10R1, **Appendix Lesson 1:** A1.1, AL1R1, AL1R2
Earth and Human Activity (ESS3)	
7-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.	
ESS3.A: Natural Resources ● Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.	**Introduction to Chemistry 2:** **Appendix Lesson 1:** A1.1, L1R1; **Appendix Lesson 2:** A2.1, L2R1
ETS2.B: Influence of Science, Engineering and Technology on Society and the Natural World ● All human activity draws on natural resources and has both short and long term consequences, positive as well as negative, for the health of people and the natural environment.	**Introduction to Chemistry 2:** **Appendix Lesson 1:** A1.1, L1R1; **Appendix Lesson 2:** A2.1, L2R1

7-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	
ESS3.C: Human Impacts on Earth Systems ● Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.	**Life Science 1:** **Lesson 11:** L11R1, L12R1 **Introduction to Chemistry 2:** **Appendix Lesson 1:** A1.1, L1R1; **Appendix Lesson 2:** A2.1, L2R1
ESS3.C: Human Impacts on Earth Systems ● Typically, as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.	**Life Science 1:** **Lesson 11:** L11R1, **Lesson 12:** L12R1 **Introduction to Chemistry 2:** **Appendix Lesson 1:** A1.1, L1R1; **Appendix Lesson 2:** A2.1, L2R1
ETS2.B: Influence of Science, Engineering and Technology on Society and the Natural World ● All human activity draws on natural resources and has both short and long term consequences, positive s well as negative, for the health of people and the natural environment.	**Introduction to Chemistry 2:** **Appendix Lesson 1:** A1.1, L1R1; **Appendix Lesson 2:** A2.1, L2R1
ETS2.B: Influence of Science, Engineering and Technology on Society and the Natural World ● The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.	**Introduction to Chemistry 2:** **Appendix Lesson 1:** A1.1, L1R1; **Appendix Lesson 2:** A2.1, L2R1
7-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	
DCI **ESS3.C: Human Impacts on Earth Systems** ● Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.	**Life Science 1:** **Lesson 11:** L11R1, **Lesson 12:** L12R1 **Introduction to Chemistry 2:** **Appendix Lesson 1:** A1.1, L1R1; **Appendix Lesson 2:** A2.1, L2R1
ETS2.B: Influence of Science, Engineering and Technology on Society and the Natural World ● All human activity draws on natural resources and has both short and long term consequences, positive s well as negative, for the health of people and the natural environment.	**Life Science 1:** **Lesson 11:** L11R1, **Lesson 12:** L12R1 **Introduction to Chemistry 2:** **Appendix Lesson 1:** A1.1, L1R1; **Appendix Lesson 2:** A2.1, L2R1
7-ESS3-5. Ask questions to clarify evidence of the factors that have impacted global temperatures over the past century.	

ESS3.D: Global Climate Change ● Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.	**Introduction to Chemistry 2:** **Appendix Lesson 1:** A1.1, L1R1
ETS2.B: Influence of Science, Engineering, and Technology on Society and the Natural World ● All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.	**Introduction to Chemistry 2:** **Appendix Lesson 1:** A1.1, L1R1
ETS2.B: Influence of Science, Engineering, and Technology on Society and the Natural World ● The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time.	**Introduction to Chemistry 2:** **Appendix Lesson 1:** A1.1, L1R1

IQWST 3.0 South Carolina Alignment

8th Grade

Key: A=Lesson, L=Lesson, R=Reading, AL=Appendix Lesson

MS-PS1 Matter and its Interactions

South Carolina Performance Expectation and Disciplinary Core Ideas	
Motion and Stability: Forces and Interactions (PS2)	
8-PS2-1. Apply Newton's third law to design a solution to a problem involving the motion of two colliding objects.	
PS2.A Forces and Motion ● For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law).	**Physical Science 3:** **Lesson 1:** A1.2, L1R1, **Lesson 4:** A4.2, A4.3, **Lesson 5:** A5.1, A5.2, L5R2, **Lesson 6:** A6.1, A6.2, **Lesson 8:** A8.1, A8.2
ETS1.B: Developing Possible Solutions ● A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors	**Physical Science 3:** **Appendix Lesson 1:** A1.1, AL1R1 **Life Science 3:** **Appendix Lesson 3:** A3.1, AL3R1 **Physical Science 1:** **Lesson 12:** A12.1, H12.1, **Lesson 13:** L13R1, A13.2, **Appendix Lesson 1:** A1.1, AL1R1
ETS2.B: Influence of Science, Engineering, and Technology on Society and the Natural World ● The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.	**Physical Science 3:** **Appendix Lesson 1:** A1.1, AL1R1 **Physical Science 1:** **Lesson 12:** A12.1, H12.1, **Lesson 13:** L13R1, A13.2, **Appendix Lesson 1:** A1.1, AL1R1
8-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	
PS2.A Forces and Motion ● The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change (inertia). The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion.	**Physical Science 3:** **Lesson 1:** A1.1, A1.2, **Lesson 2:** A2.1, A2.2, H2.2, L2R2, A2.4, **Lesson 3:** A3.1, A3.2, H3.2, A3.3, L3R1, **Lesson 4:** A4.1, A4.2, L4R1, L4R2, **Lesson 5:** A5.1, A5.2, L5R2, **Lesson 6:** A6.1, A6.2, A6.3, **Lesson 7:** A7.1, H7.1, A7.2, A7.3, **Lesson 8:** A8.1, L8R1, A8.2, A8.3
PS2.A Forces and Motion ● The positions of objects and the directions of forces and motions must be described using a qualitative comparison and scalar quantities. In order to share information with other people, a reference frame must also be shared.	**Physical Science 3:** **Lesson 1:** A1.1, **Lesson 2:** A2.1, A2.2, H2.2, A2.3, L2R2, A2.4, **Lesson 3:** A3.1, A3.2, H3.2, A3.3, L3R1, **Lesson 4:** A4.1, A4.2, A4.3, L4R1, L4R2, **Lesson 5:** A5.1, A5.2, L5R2, **Lesson 6:** A6.1, A6.2, A6.3, **Lesson 7:** A7.1, H7.1, A7.2, A7.3, **Lesson 8:** A8.1, L8R1, A8.2, A8.3

8-PS2-3. Analyze and interpret data to determine the factors that affect the strength of electric and magnetic forces.	
PS2.B Types of Interactions ● Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.	**Physical Science 3:** **Lesson 2:** A2.3, A3.3, **Lesson 8:** A8.2, **Appendix Lesson 1:** A1.1, AL1R1
8-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.	
PS2.B Types of Interactions ● Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.	**Physical Science 3:** **Lesson 2:** A2.3, L2R2, **Lesson 3:** A3.3, **Lesson 4:** A4.2, **Lesson 8:** A8.3,**Appendix Lesson 2:** A2.1, AL2R1, A2.2, A2.3 **Physical Science 1 – Can I Believe My Eyes?** **Appendix Lesson 3:** A3.1, AL3R1, A3.2, A3.3
8-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.	
PS2.B Types of Interactions ● Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be illustrated by their effect on a test object (a charged object, or a ball, respectively).	**Physical Science 3:** **Lesson 2:** A2.3
Waves and Their Applications in Technologies for Information Transfer (PS4)	
8-PS4-1. Using mathematical representations, describe a simple model for waves, that includes how the amplitude of a wave is related to the energy in a wave.	
PS4.A Wave Properties ● A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.	**Physical Science 1:** **Lesson 1:** A1.1, L1R1, A1.2, **Lesson 2:** A2.1, A2.2, L2R1, **Lesson 3:** A3.1, L3R1, A3.1, L3R2, **Lesson 4:** A4.1, L4R1, **Lesson 5:** A5.1, A5.2, L5R1, **Lesson 6:** A6.1, A6.2, A6.3, L6R1, **Lesson 7:** A7.1, A7.2, A7.3, **Lesson 11:** A11.1, A11.2 **Lesson 9:** A9.1, **Lesson 12:** A12.2, L12R1, H12.1, **Lesson 13:** A13.1, L13R1
8-PS4-3. Communicate information to support the claim that digital devices are used to improve our understanding of how waves transmit information.	
PS4.C Information Technologies and Instrumentation ● Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.	**Physical Science 1:** **Lesson 7:** L7R1, **Lesson 12:** A12.1, H12.1, **Lesson 13:** L13R1, A13.2, **Appendix Lesson 1:** A1.1, AL1R1
ETS2.B: Influence of Science, Engineering, and Technology on Society and the Natural World	**Physical Science 1:**

• Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.	**Lesson 7:** L7R1, **Lesson 8:** A8.1, A8.2, L8R1, A8.3, A8.4, L8R2, **Lesson 9:** A9.1, A9.2, A9.3, L9R1, **Lesson 10:** A10.1, L10R1, A10.2, L10R2, **Lesson 12:** A12.1, H12.1, **Lesson 13:** L13R1, A13.2, **Appendix Lesson 1:** A1.1, AL1R1
From Molecules to Organisms: Structures and Processes (LS1)	
8-LS1-4. Use arguments, based on empirical evidence and scientific reasoning, to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	
LS1.B Growth and Development of Organisms • Animals engage in characteristic behaviors that increase the odds of reproduction.	**Life Science 3:** **Appendix Lesson 2**: A2.3
LS1.B Growth and Development of Organisms • Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.	**Life Science 3:** **Lesson 2:** A2.2
8-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	
LS1.B Growth and Development of Organisms • Genetic factors as well as local conditions affect the growth of the adult plant. The growth of an animal is controlled by genetic factors, food intake, and interactions with other organisms, and each species has a typical adult size range.	**Life Science 3:** **Lesson 8:** A8.3, L8R2, **Lesson 9:** L9R1
Heredity: Inheritance and Variation of Traits (LS3)	
8-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.	
LS3.A Inheritance of Traits • Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual.	**Life Science 3:** **Lesson 1:** A1.3, L1R1, **Lesson 5:** A5.1, **Lesson 6:** A6.1, A6.2, L6R1, **Lesson 7:** A7.1, A7.2, L7R1
LS3.A Inheritance of Traits • Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits	**Life Science 3:** **Lesson 1:** A1.3, L1R1, **Lesson 5:** A5.1, **Lesson 6:** A6.1, A6.2, L6R1, **Lesson 7:** A7.1, A7.2, L7R1
LS3.B Variation of Traits • In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations.	**Life Science 3:** **Lesson 3:** L3R1

LS3.B Variation of Traits ● Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.	**Life Science 3:** **Lesson 3:** L3R1
8-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.	
LS1.B Growth and Development of Organisms ● Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.	**Life Science 3:** **Lesson 1:** A1.1, A1.2, A1.3, **Lesson 2:** A2.2, L2R2 L1R1, A2.3, **Lesson 3:** A3.2, A3.2, **Lesson 4:** A4.1, A4.2, A4.3, L4R1, **Lesson 5:** A5.2, L5R1, **Lesson 8:** A8.4, L8R2
LS3.A Inheritance of Traits ● Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited	**Life Science 3:** **Lesson 1:** Intro to Unit, Intro to Lesson 1, A1.1, A1.2, A1.3, L1R1, **Lesson 2:** A2.1, L2R1, A2.2, L2R2, A2.3, **Lesson 3:** A3.1, A3.2, A3.2, **Lesson 4:** A4.1, A4.2, A4.3, L4R1, **Lesson 5:** A5.2, L5R1, **Lesson 8:** A8.1, A8.2, A8.3, A8.4, L8R2
LS3.B Variation of Traits ● In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. In asexual reproduction, an organism's DNA is replicated and passed to its offspring creating a genetic copy of the parent.	**Life Science 3:** **Lesson 1:** A1.1, A1.3, L1R1, **Lesson 2:** A2.2, L2R2, A2.3, **Lesson 3:** A3.1, A3.2, A3.2, **Lesson 4:** A4.1, A4.2, A4.3, L4R1, **Lesson 5:** A5.2, L5R1, **Lesson 8:** A8.4, L8R2
Biological Evolution: Unity and Diversity (LS4)	
8-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operated in the past as they do today.	
LS4.A Evidence of Common Ancestry and Diversity ● The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.	**Life Science 3 - Why Do Organisms Look the Way They Do?** **Appendix Lesson 1:** A1.1, A1.2
ESS2.E: Biogeology ● Sudden changes in conditions (e.g., meteor impacts, major volcanic eruptions) have caused mass extinctions, but these changes, as well as more gradual ones, have ultimately allowed other life forms to flourish.	**Life Science 3 - Why Do Organisms Look the Way They Do?** **Appendix Lesson 1:** A1.1, A1.2
8-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer their ancestral relationships.	

LS4.A Evidence of Common Ancestry and Diversity ● Anatomical similarities and differences among modern organisms and between modern and fossil organisms in the fossil record enable the reconstruction of the history and the inference of lines of ancestral relationships.	**Life Science 3:** **Appendix Lesson 1:** A1.1, A1.2
8-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individual's probability of surviving and reproducing in a specific environment.	
LS4.B Natural Selection ● Natural selection leads to the predominance of certain traits in a population, and the suppression of others.	**Life Science 3:** **Lesson 9:** Intro to Lesson 9, A9.1, L9R1, **Lesson 10:** A10.1, A10.2, A10.3, L10R1, A10.4, A10.5, H10.5, **Lesson 11:** A11.1, A11.2, A11.3, **Appendix Lesson 2**: A2.1
8-LS4-5. Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.	
LS4.B Natural Selection ● In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed onto offspring.	**Life Science 3:** **Lesson 11:** L11R1, **Appendix Lesson 2:** A2.3, **Appendix Lesson 3:** A3.1, AL3R1
ETS2.A: Interdependence of Science, Engineering, and Technology ● Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems.	**Life Science 3:** **Appendix Lesson 3:** A3.1, AL3R1
8-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	
LS4.C Adaptation ● Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.	**Life Science 3:** **Lesson 9:** A9.2, A9.3, **Appendix Lesson 2:** A2.2
Earth's Place in the Universe (ESS1)	
8-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, tides, and seasons.	
ESS1.A The Universe and Its Stars ● Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.	**Physical Science 3:** **Appendix Lesson 2:** A2.1, AL2R1, A2.2, A2.3 **Physical Science 1:** **Appendix Lesson 3:** A3.1, AL3R1, A3.2, A3.3

ESS1: Earth and the Solar System ● This model of the solar system can explain tides (including spring and neap), eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.	**Physical Science 1:** **Appendix Lesson 3:** A3.1, AL3R1, A3.2, A3.3
8-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.	
ESS1.A The Universe and Its Stars ● Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.	**Physical Science 3:** **Appendix Lesson 2:** A2.1, AL2R1, A2.2, A2.3
ESS1B: Earth and the Solar System ● The solar system consists of the sun, planets, their moons, and other celestial objects that are held in orbit around the sun by its gravitational pull on them. The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.	**Physical Science 3:** **Appendix Lesson 2:** A2.1, AL2R1, A2.2, A2.3
8-ESS1-3. Evaluate information to determine scale properties of objects in the solar system.	
ESS1B: Earth and the Solar System ● The solar system consists of the sun, planets, their moons, and other celestial objects that are held in orbit around the sun by its gravitational pull on them.	**Physical Science 1:** **Appendix Lesson 2:** A2.1, AL2R1, A2.2, **Appendix Lesson 3:** A3.1, AL3R1, A3.2, A3.3 **Physical Science 3:** **Appendix Lesson 2:** A2.1, AL2R1, A2.2, A2.3
ETS2.A: Interdependence of Science, Engineering, and Technology ● Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems.	**Physical Science 3:** **Appendix Lesson 2:** A2.1, AL2R1, A2.2, A2.3