Activate Learning

IQWST Units, Lessons, and Activities Aligned to NGSS Performance Expectations

Performance Expectation	PE Description	Disciplinary Core Ideas	DCI Descriptions	Addressed in IQWST Unit(s)	Activities and Readings
MS-PS1-1	Develop models to describe the atomic composition of simple molecules and extended structures.	**PS1.A**	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.(1) Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (2)	**Introduction to Chemistry 1** - How Can I Smell Things from a Distance? **Introduction to Chemistry 2**--How Can I Make New Stuff from Old Stuff? **Introduction to Chemistry 3** - How Does Food Provide My Body With Energy?	**Introduction to Chemistry 1:** Reading 6.2, Reading 8.1, Activity 8.2, Activity 8.3, Reading 8.3, Activity 9.1, Reading 9.1, Activity 10.1, Reading 10.1, Activity 16.1 **Introduction to Chemistry 2:** Reading 3.1, Reading 7.1, Activity 7.1, Activity 8.2, Reading 8.2, Activity 8.3, Reading 8.3, Activity 9.1, Reading 9.1, Reading 10.1, Reading 12.2, Activity 12.A **Introduction to Chemistry 3:** Activity 3.1, Activity 3.2, Reading 3.2
MS-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, PS1.B**	Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (PS1.A) 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. (PS1.B)	**Physical Science 2** - Why Do Some Things Stop While Others Keep Going? **Introduction to Chemistry 1** - How Can I Smell Things from a Distance? **Introduction to Chemistry 2** - How Can I Make New Stuff from Old Stuff? **Introduction to Chemistry 3** - How Does Food Provide My Body With Energy?	**Physical Science 2:** Reading 8.3: How Much Chemical Energy Is There? **Introduction to Chemistry 1:** Activity 7.1: gases All Look the Same to Me, Reading 7.1: How Can I Tell Whether Things that Look the Same Really Are the Same?, Reading 7.2: Detectors Work Because of Properties, Activity 8.1: Investigating Elements, Reading 8.2: Why Do Properties of Materials Matter? **Introduction to Chemistry 2:** Activity 1.1: Can I Make New Stuff from Old Stuff?, Activity 1.2: How Is This Stuff the Same and Different?, Activity 1.3: Demonstration and Review of Substance, Mixture, and Property, Reading 1.2: What Makes a Substance a Special Kind of Stuff?, Activity 2.1: Teacher Demonstration...Solubility, Activity 2.2: Investigating Solubility of Soap and Fat, Reading 2.1: why Can I Easily Wash Soap off My Hands with Water?, Activity 3.1: Teacher Demonstration of Melting Point, Reading 3.1: Melting Points, Activity 3.2: Does the Size of Something Affect Its Properties?, Reading 3.2: Which Properties Can I Use When?, Activity 4.1: Exploring the Relationship between Mass and Volume, Reading 4.1: How Can Two Objects that Are the Same Size Have Different Masses?, Activity 4.2: Do Fat and Soap Have the Same Density?, Activity 5.1: Are Fat and Soap the Same or Different Substances? Reading 5.1: What Evidence Would I Use to Tell if the Stones in a Ring Are the Same or Different?, Activity 6.1: Teacher Demonstration of Investigation Procedure, Reading 6.1: Could Someone Change Straw into Gold?, Reading 6.2: What Is a Chemical Reaction?, Activity 7.1: Is Burning a Chemical Reaction? Reading 7.1: Is Burning a Chemical Reaction?, Activity 8.1: How Can I Investigate Acid Rain in My Classroom?, Activity 8.2: Does Acid Rain Make New Substances? Reading 8.2: Does Acid Rain Make New Substances?, Activity 8.3: Representing Chemical Reactions in Words and Symbols, Reading 8.3: What Are the Many Ways of Representing Any Chemical Reaction?, Activity 9.1: Does Electrolysis of Water Make New Substances?, Activity 11.1: How Can I Make Soap from Fat?, Reading 11.1: Do People Really make Soap from Fat?, Activity 11.2: Testing the Properties of Soap, Activity 13.1: Is My Soap a New Substance?, Reading 13.1: How Does My Soap Compare with Colonial Soap and modern Soap?, Activity 14.1: How Does My Soap Compare with Commercial Brand Soap?, Reading 14.1: The Science behind Rumpelstiltskin, Activity 14.2: How Can I Improve My Soap? **Introduction to Chemistry 3:** Activity 1.1: What Happens in My Body When I Run around the School?
MS-PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society	**PS1.A, PS1.B**	Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.(PS1.A), 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. (PS1.B)	**Introduction to Chemistry 1** - How Can I Smell Things from a Distance? **Introduction to Chemistry 2** - How Can I Make New Stuff from Old Stuff?	**Introduction to Chemistry 1:** Homework 7.1: When Are Properties Useful to Me? **Introduction to Chemistry 2:** Reading 1.1: What Is Important about the Stuff I Use? **Concept Builder:** Human Impacts on Earth's Systems
MS-PS1-4	Develop 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, PS3.A**	Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (1) 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. (2) The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.(3) (PS1.A), 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 one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects.(1) 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. 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. (2) (PS3.A)	**Physical Science 2** - Why Do Some Things Stop While Others Keep Going? **Earth Science 1** – How Does Water Shape Our World? **Earth Science 2** – What Makes the Weather Change? **Earth Science 3** – How is the Earth Changing? **Introduction to Chemistry 1** - How Can I Smell Things from a Distance? **Introduction to Chemistry 2** - How Can I Make New Stuff from Old Stuff?	**Physical Science 2:** Activity 6.2: Thermal Energy: Solids, Activity 6.3: Molecules in Motion: Liquids and Gases, Activity 6.4: What Determines How Much Thermal Energy an Object Has? **Earth Science 1:** Homework 4.4: Moving Water **Earth Science 2:** Activity 2.2: A Little Heat from Me to You, Reading 2.2: Why Does Conduction Matter?, Activity 3.1: How Do Differences in Temperature Affect Air Masses?, Activity 3.2: What Happens When Air Is Heated or Cooled? **Earth Science 3:** Activity 4.1: Convection in Liquids **Introduction to Chemistry 1:** Activity 1.2: Developing an Initial Model, Activity 2.1: Can Something Have Mass Even if I Cannot Feel It?, Reading 2.1: Can Something Have Mass Even if I Cannot Feel It?, Activity 2.2: Measuring Volume, Activity 2.3: What Happens to My Lungs When I Breathe in Air?, Reading 2.3: What Happens to My Lungs When I Breathe in Air?, Homework 2.3: Mass and Volume, Activity 3.1: Investigating Matter, Reading 3.1: Three Forms of Matter: Solid, Liquid, Gas, Homework 3.1: Classifying Forms of Matter, Activity 3.2: Why Does Water Have many Names?, Reading 3.2: What Needs to Happen to a Material so that I Can Smell It?, Activity 4.1: How Can I Model the Things Gases Do?, Reading 4.1: How Can I Model the Things Gases Do?, Activity 5.1: What Else Can Gases Do?, Reading 5.1: How Can I Model the Things Gases Do?, Activity 5.2: Developing Models, Activity 5.3: Developing and Using a Consensus Model, Activity 6.1: Comparing Two Clear Liquids, Activity 6.2: How Does the Odor Get to My Nose?, Activity 9.2: Summarizing the Idea "Odors in the Air", Activity 11.1: How Can I Make Molecules Move Faster?, Reading 11.1: How Can I Make Particles Move Faster?, Activity 11.2: How Else Can I Model Odor Moving?, Activity 12.1: What Happens When Gases Are Cooled and Heated?, Reading 12.1: How Can the Volume of a Balloon Change Without Removing or Adding Air?, Activity 12.2: A Physical Model of Heating and Cooling a Gas, Activity 13.1: What Happens to Bromine as It Is Cooled or Heated?, Reading 13.1: How Do Substances Become part of the Air?, Activity 13.2: Modeling the Bromine Tube, Activity 13.3: What Happens When Water Boils?, Activity 13.4, Where Did the Water Come From?, Reading 13.4: Where Do Drops of Water Come From?, Activity 14.1: What Happens to molecules of a Liquid at Higher Temperatures?, Reading 14.1: How Do Odor Molecules Move?, Activity 14.2: Which Liquid Moves Faster?, Reading 14.2: How Does an Oven Make Hot Chocolate Hot?, Homework 14.2: What Happens When Ice Melts?, Activity 15.1: What Happens to the Molecules as a Solid Melts?, Reading 15.1: What Happens to Molecules When a Substance Melts?, Activity 15.2: Does Menthol Have to Melt Before I Smell It?, Reading 15.2: How Can I Smell Something that Is Solid?, Reading 16.1: Summarizing This Unit: What Have I Learned about Matter?, Activity 16.2: what Else Can My Model Explain? **Introduction to Chemistry 2:** Reading 9.1: What Is the Same and Different about Boiling Water and Electrolysis?, Activity 10.1: Do I Always Make New Substances When I Put Substances Together?, Reading 10.1: What Happens to Atoms and Molecules When I See Different Processes?
MS-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**	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. (1) The total number of each type of atom is conserved, and thus the mass does not change. (2)	**Introduction to Chemistry 2** - How Can I Make New Stuff from Old Stuff? **Introduction to Chemistry 3** - How Does Food Provide My Body With Energy?	**Introduction to Chemistry 2:** Activity 12.A: Making Gloop, Activity 12.1: Does Mass Change When Alka-Seltzer Reacts?, Reading 12.1: What Happens to Mass During a Chemical Reaction in an Open System?, Activity 12.2: Does Mass really Change When Alka-Seltzer Reacts?, Reading 12.2: What Happens to Mass during a Chemical Reaction in a Closed System? **Introduction to Chemistry 3:** Activity 8.1: What Does Food Need to Burn?

Activate Learning

IQWST Units, Lessons, and Activities Aligned to NGSS Performance Expectations

Performance Expectation	PE Description	Disciplinary Core Ideas	DCI Descriptions	Addressed in IQWST Unit(s)	Activities and Readings
MS-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, ETS1.B, ETS1.C**	Some chemical reactions release energy, others store energy. (PS1.B) A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (ETS1.B) 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. (1) (ETS1.C) 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.(2)(ETS1.C)	**Physical Science 2** - Why Do Some Things Stop While Others Keep Going?	**Physical Science 2:** Activity 8.1: Thermal Energy in Chemical Reactions, Activity 8.2: The Paper Cup, Activity 8.3: How Much Chemical Energy Is There?
MS-PS2-1	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.	**PS2.A**	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** - How Will it Move?	**Physical Science 3:** Reading 1.2: Newton's Cradle, Activity 4.2: Measuring Forces with Force Probes and Newton's Third Law, Activity 4.3: Revisiting Familiar Apparatuses, Activity 6.1: Graphs That Show When a Ball Moves
MS-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**	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. 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. (1) All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared.(2)	**Physical Science 3** - How Will it Move?	**Physical Science 3**: Activity 2.1: Analyzing Apparatuses, Activity 2.2: Systems and Contact Forces, Homework 2.2: The World's Greatest Sandwich, Reading 2.3: Balance and Force, Activity 2.4: Putting Things Together, Activity 3.1: Objects That Begin Moving, Activity 3.2: More Objects That Begin Moving, Homework 3.2: Heavy Duty Shopping, Activity 3.3: Complex Systems that Begin Moving, Reading 3.3: Why Does an Object Start Moving?, Activity 4.1: Measuring Forces, Reading 4.3: What Keeps Things from Moving?, Reading 4.4: Who Will Win a Tug-of-War?, Activity 5.1: A Book That Stops Moving, Homework 5.1: Hard and Soft Landings, Activity 5.2: Recoil in the Magnetic Cannon, Reading 5.2: What Affects How Quickly Something Stops Moving?, Homework 6.1: Rat Race, Activity 6.2: Graphs That Show How a Ball Moves, Homework 6.2: Rat Race Part 2, Activity 6.3: Motion Graphs for the Magnetic Cannon, Activity 7.1: Changing Speed, Homework 7.1: Forces and Motions, Activity 7.2: Changing Direction, Activity 7.3: Newton's First Law, Activity 8.1: Revisiting and Summarizing the Scientific Principles, Homework 8.1: Motion Graph, Activity 8.2: Can We Explain the Behavior of the Magnetic Cannon?, Activity 8.3: Concluding the Activity
MS-PS2-3	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.	**PS2.B**	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 2** - Why Do Some Things Stop While Others Keep Going?	**Physical Science 2:** Activity 9.2: The Homemade Battery, Reading 9.2: Batteries and Hydrogen Cells, Activity 9.3: What Does an Electrical Generator Do?
MS-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**	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 2** - Why Do Some Things Stop While Others Keep Going? **Physical Science 3** - How Will it Move?	**Physical Science 2:** Reading 3.1: Gravitational and Kinetic Energy, Activity 3.2: Introducing Gravitaitonal Energy, Energy Conversions, and Energy Conversion Diagrams **Physical Science 3:** Reading 7.3: Tides
MS-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**	Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively).	**Physical Science 3** - How Will it Move?	**Physical Science 3:** Activity 2.3: Forces That Act at a Distance
MS-PS3-1	Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.	**PS3.A**	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** - Why Do Some Things Stop While Others Keep Going?	**Physical Science 2:** Activity 1.1: Radiometer Demo-Rube Goldberg Video, Activity 1.2: Observing Surprising Devices, Reading 1.1: Perpetual Motion Machines, Activity 2.1: Objects in Motion, Reading 2.1: Impact Craters, Homework 2.1: Kinetic Energy, Activity 2.2: Investigating Kinetic Energy, Activity 2.3: Predicting the Amount of Kinetic Energy, Activity 3.1: Investigating Elevation and Energy
MS-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.	**PS3.A, PS3.C**	A system of objects may also contain stored (potential) energy, depending on their relative positions.(PS3.A) When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (PS3.C)	**Physical Science 2** - Why Do Some Things Stop While Others Keep Going? **Physical Science 3** - How Will It Move?	**Physical Science 2:** Activity 3.2: Introducing Gravitational energy, Energy Conversions, and Energy Conversion Diagrams, Homework 3.2: Investigating the Playground--2, Activity 3.3: Investigating How a Pendulum works, Activity 4.1: What Happens to a Ball as it Bounces?, Activity 5.2: Demonstration: Bouncing Two Balls Together, Activity 5.3: Observing Objects that Slow Down before They Stop, Reading 6.1: Potential Energy **Physical Science 3:** Activity 2.1: Analyzing Apparatuses, Activity 2.2: Systems and Contact Forces, Homework 2.2: The World's Greatest Sandwich, Reading 2.3: Balance and Force, Activity 2.4: Putting Things Together, Activity 3.1: Objects That Begin Moving, Activity 3.2: More Objects That Begin Moving, Homework 3.2: Heavy Duty Shopping, Activity 3.3: Complex Systems that Begin Moving, Reading 3.3: Why Does an Object Start Moving?, Activity 4.1: Measuring Forces, Reading 4.3: What Keeps Things from Moving?, Reading 4.4: Who Will Win a Tug-of-War?, Activity 5.1: A Book That Stops Moving, Homework 5.1: Hard and Soft Landings, Activity 5.2: Recoil in the Magnetic Cannon, Reading 5.2: What Affects How Quickly Something Stops Moving?, Homework 6.1: Rat Race, Activity 6.2: Graphs That Show How a Ball Moves, Homework 6.2: Rat Race Part 2, Activity 6.3: Motion Graphs for the Magnetic Cannon, Activity 7.1: Changing Speed, Homework 7.1: Forces and Motions, Activity 7.2: Changing Direction, Activity 7.3: Newton's First Law, Activity 8.1: Revisiting and Summarizing the Scientific Principles, Homework 8.1: Motion Graph, Activity 8.2: Can We Explain the Behavior of the Magnetic Cannon?, Activity 8.3: Concluding the Activity

Activate Learning

IQWST Units, Lessons, and Activities Aligned to NGSS Performance Expectations

Performance Expectation	PE Description	Disciplinary Core Ideas	DCI Descriptions	Addressed in IQWST Unit(s)	Activities and Readings
MS-PS3-3	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes the thermal energy transfer.	**PS3.A, PS3.B, ETS1.A**	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. (PS3.A) Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (PS3.B)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. (ETS1.A)	**Physical Science 2** - Why Do Some Things Stop While Others Keep Going? **Introduction to Chemistry 1** - How Can I Smell Things From a Distance?	**Physical Science 2:** Homework 8.3: The Aeolipile **Introduction to Chemistry 1:** Activity 11.1: How Can I Make Molecules Move Faster?, Reading 11.1: How Can I Make Particles Move Faster?, Activity 11.2: How Else Can I Model Odor Moving?, Activity 12.1: What Happens When Gases Are Cooled and Heated?, Reading 12.1: How Can the Volume of a Balloon Change Without Removing or Adding Air?, Activity 12.2: A Physical Model of Heating and Cooling a Gas, Activity 13.1: What Happens to Bromine as It Is Cooled or Heated?, Reading 13.1: How Do Substances Become part of the Air?, Activity 13.2: Modeling the Bromine Tube, Activity 13.3: What Happens When Water Boils?, Activity 13.4, Where Did the Water Come From?, Reading 13.4: Where Do Drops of Water Come From?, Activity 14.1: What Happens to molecules of a Liquid at Higher Temperatures?, Reading 14.1: How Do Odor Molecules Move?, Activity 14.2: Which Liquid Moves Faster?, Reading 14.2: How Does an Oven Make Hot Chocolate Hot?, Homework 14.2: What Happens When Ice Melts?, Activity 15.1: What Happens to the Molecules as a Solid Melts?, Reading 15.1: What Happens to Molecules When a Substance Melts?, Activity 15.2: Does Menthol Have to Melt Before I Smell It?, Reading 15.2: How Can I Smell Something that Is Solid?, Reading 16.1: Summarizing This Unit: What Have I Learned about Matter?, Activity 16.2: what Else Can My Model Explain?
MS-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, PS3.B**	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. (PS3.A) 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. (PS3.B)	**Physical Science 1** – Can I Believe My Eyes? **Physical Science 2** - Why Do Some Things Stop While Others Keep Going? **Introduction to Chemistry 1** - How Can I Smell Things From a Distance?	**Physical Science 1**: Activity 8.2: Investigating Heating by Light, Reading 8.2: Solar Power Plants, Reading 8.4: Solar Energy **Physical Science 2:** Activity 2.1: Objects in Motion, Reading 2.1: Impact Craters, Homework 2.1: Kinetic Energy, Activity 2.2: Investigating Kinetic Energy, Activity 2.3: Predicting the Amount of Kinetic Energy, Activity 5.1: Revisiting the Bouncing Ball, Reading 5.1: Energy Transfer, Activity 5.2: Demonstration: Bouncing Two Balls Together, Activity 5.3: Observing Objects that Slow Down Before They Stop, Activity 5.4: Energy Transfer and Systems **Introduction to Chemistry 1:** Activity 11.1: How Can I Make Molecules Move Faster?, Reading 11.1: How Can I Make Particles Move Faster?, Activity 11.2: How Else Can I Model Odor Moving?, Activity 12.1: What Happens When Gases Are Cooled or Heated?, Reading 12.1: How Can the Volume of a Balloon Change Without Removing or Adding Air?, Activity 12.2: A Physical Model of Heating and Cooling a Gas, Activity 13.1: What Happens to Bromine as It Is Cooled or Heated?, Reading 13.1: How Do Substances Become part of the Air?, Activity 13.2: Modeling the Bromine Tube, Activity 13.3: What Happens When Water Boils?, Activity 13.4, Where Did the Water Come From?, Reading 13.4: Where Do Drops of Water Come From?, Activity 14.1: What Happens to molecules of a Liquid at Higher Temperatures?, Reading 14.1: How Do Odor Molecules Move?, Activity 14.2: Which Liquid Moves Faster?, Reading 14.2: How Does an Oven Make Hot Chocolate Hot?, Homework 14.2: What Happens When Ice Melts?, Activity 15.1: What Happens to the Molecules as a Solid Melts?, Reading 15.1: What Happens to Molecules When a Substance Melts?, Activity 15.2: Does Menthol Have to Melt Before I Smell It?, Reading 15.2: How Can I Smell Something that Is Solid?, Reading 16.1: Summarizing This Unit: What Have I Learned about Matter?, Activity 16.2: what Else Can My Model Explain?
MS-PS3-5	Construct, use, and present arguments to support the claim that when the motion energy of an object changes, energy is transferred to or from the object.	**PS3.B**	When the motion energy of an object changes, there is inevitably some other change in energy at the same time.	**Physical Science 2** - Why Do Some Things Stop While Others Keep Going? **Physical Science 3** - How Will it Move? **Earth Science 2** – What Makes the Weather Change?	**Physical Science 2:** Reading 3.1: gravitational and Kinetic Energy, Homework 3.1: Investigating the Playground--1, Reading 4.1: Elasticity and the Body, Homework 4.1: Elastic Energy, Activity 4.2: Investigating Elastic Energy, Activity 4.3: What Determines How Much Elastic Energy an Object Can Have?, Activity 5.1: Revisiting the Bouncing Ball, Reading 5.1: Energy Transfer, Activity 5.4: Energy Transfer and Systems, Activity 6.1: Colliding Balls, Homework 6.1: Add Thermal energy in the Energy Conversion Diagram, Activity 8.4: Chemical Energy Transformations, Homework 8.4: Energy Types and their Factors, Activity 9.1: How Can I Move Energy?, Homework 9.1: Electricity in Our Homes, Homework 9.2: why Do Some Things Works Longer?, Activity 11.1: Revisiting Learning Sets 103, Reading 11.1: Examples of Energy Resources **Physical Science 3:** Activity 1.1: Anchoring Activity, Activity 1.2: Driving Question Board **Earth Science 2:** Activity 3.3: Why Heat Rises, Reading 3.3: Why Learn about Convection?
MS-PS4-1	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.	**PS4.A**	A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.	**Physical Science 1** – Can I Believe My Eyes? **Physical Science 2** - Why Do Some Things Stop While Others Keep Going?	**Physical Science 1:** Activity 6.1: Reflection, Activity 6.2: Investigating Scattering and Reflection, Activity 7.2: Measuring Light Transmission, Homework 12.1: Is the Remote Emitting Light? **Physical Science 2:** Activity 7.1: What Is Sound Energy?, Activity 10.1: How Light Makes Things Happen
MS-PS4-2	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	**PS4.A, PS4.B**	A sound wave needs a medium through which it is transmitted. (PS4.A) 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. (1) 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.(2) A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (3) However, because light can travel through space, it cannot be a matter wave, like sound or water waves.(PS3.B)	**Physical Science 1** – Can I Believe My Eyes? **Physical Science 2** - Why Do Some Things Stop While Others Keep Going?	**Physical Science 1:** Activity 3.1: Preparing to Develop Models, Reading 3.1: Modeling, Activity 3.2: Building the Consensus Model, Reading 3.2: Faster than a Speeding Bullet, Homework 4.1: Exploring Shadows, Activity 5.1: Introducing Shadows, Homework 5.1: A Midnight Crime, Activity 5.2: All Shadows Are Not the Same, Homework 6.2: Investigating Scattering and Reflection-Part 1, Activity 6.3: Explaining Scattering, Reflection and Images, Homework 6.3: Scattering and Reflection-Part 2, Reading 6.3: Polishing Objects, Activity 7.1: Evaluating the Light Model, Homework 7.2: Transmission of Light-Part 1, Activity 7.3: revising the Light Model, Homework 7.3: Transmission of Light-Part 2, Activity 8.1: Light Makes Things Happen, Homework 8.2: Absorption of Light, Activity 8.3: Keeping Track of Light, Activity 8.4: Revisiting Phenomena Caused by Light, Homework 8.4: Absorption of Light, Activity 9.1: Mixing Colors of Light with Projectors, Activity 9.2: Mixing Colors of Light on Computers, Activity 10.1, Analyzing Color Composition, Reading 10.1: Rainbows, Activity 10.2: Revisiting the Consensus Model, Reading 10.3: Diffraction, Activity 11.1: Revisiting Learning Sets 1-3, Activity 11.2: Explaining How We See Objects, Including Optical Illusions, Activity 12.1: What Is Leaving a Remote Control?, Reading 12.1: Infrared Light, Activity 12.2: Introducing the Wave Model, Activity 13.1: Investigating UV Light, Homework 13.1: UV Light and UV/IR Imagery, Reading 13.1: Nonvisible Light, Homework 13.2: UV Light and UV/IR Imagery **Physical Science 2:** Reading 7.1: Sound Energy, Reading 10.1: Solar Power Plants, Homework 10.1: How Light Makes Things Happen
MS-PS4-3	Integrate qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.	**PS4.C**	Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.	**Physical Science 1** – Can I Believe My Eyes?	**Physical Science 1:** Reading 7.3: Using Light in Optical Fibers, Activity 13.2: How Would the World Look If People Could See UV and IR Light?
MS-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**	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** - What is Going On Inside Me?	**Life Science 2:** Activity 1.1: What is Inside Me?, Reading 1.1: How Did Scientists Find These Tiny Cells?, Activity 1A.1: Preparing a Wet Mount, Activity 1A.2: Determining Field of View, Activity 1A.3: Moving Objects on the Slide, Activity 2.1: What Is in My Yogurt?, Activity 2.2: Are There Cells in a Drop of water?, Activity 2.3: How Do All These Compare?, Reading 2.3: Cells: Here, There, Everywhere, Activity: Introducing the Scientific Principles List.
MS-LS1-2	Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.	**LS1.A**	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** - What is Going On Inside Me? **Life Science 3** - Why Do Organisms Look the Way They Do?	**Life Science 2:** Activity 5.2: Can Water Move into the Cell?, Reading 5.2: The Ins and Outs of Osmosis, Activity 5.3: Can Food Move into the Cell?, Activity 7.2: How Do Cells Make More Cells?, Activity 8.1: What Is the Rate?, Activity 9.1: Where Is Food Used in My Body?, Reading 9.1: SimCell **Life Science 3:** Activity 5.1: How Do I Get New Cells?

Activate Learning

IQWST Units, Lessons, and Activities Aligned to NGSS Performance Expectations

Performance Expectation	PE Description	Disciplinary Core Ideas	DCI Descriptions	Addressed in IQWST Unit(s)	Activities and Readings
MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.	**LS1.A**	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** - What is Going On Inside Me?	**Life Science 2:** Activity 3.1: Dissecting a Simple System, Reading 3.1: Systems, Systems, and More Systems, Activity 3.2: Am I a System?, Activity 4.1: Lab: Grind, Slush, and Down, Activity 4.2: Itsier, Bitsier Foodstuff, Activity 4.3: Food's Journey Continues, Activity 5.1: Can Food Molecules Move through My Body?, Activity 6.2: Inspector Bio: What Happened to the Oxygen and Why? Reading 6.3: Aahhh-Choo! Cough-Cough! Whh-eeez!, Activity 7.1: What Is Inside a Bone?, Reading 7.1: What Is My Skeleton Made Of?, Activity 10.1: Who Has the "Touch"?, Reading 10.1: What Happens When I Get the Chills?, Activity 11.1: How Does Everything Work Together?
MS-LS1-4	Use argument 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**	Animals engage in characteristic behaviors that increase the odds of reproduction.(1) Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (2)	**Life Science 1** - Where Have All the Creatures Gone? **Life Science 2** - What is Going On Inside Me? **Life Science 3** - Why Do Organisms Look the Way They Do?	**Life Science 1:** Reading 7.2: Sea Lamprey and Lake Trout, Reading 8.1: Plant Structures **Life Science 2:** Reading 8.1: Organisms' Balancing Acts **Life Science 3:** Activity 2.2: How Do Plants Reproduce? **Concept Builder:** Macroevolution
MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	**LS1.B**	Genetic factors as well as local conditions affect the growth of the adult plant.	**Introduction to Chemistry 3** - How Does Food Provide My Body With Energy? **Life Science 1** - Where Have All the Creatures Gone? **Life Science 3** - Why Do Organisms Look the Way They Do?	**Introduction to Chemistry 3:** Activity 6.1: What Do Plants Need to Grow?, Reading 6.1: What Do Plants Need to Grow? **Life Science 1:** Reading 4.2: Hydroponics **Life Science 3:** Activity 8.1: Variations, Variations, and More Variations, Activity 8.2: How Can We Show Ranges of Variation?
MS-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, PS3.D**	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. (LS1.C) 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. (PS3.D)	Introduction to Chemistry 3 - How Does Food Provide My Body With Energy? Life Science 1 - Where Have All the Creatures Gone?	**Introduction to Chemistry 3:** Activity 2.1: What Should I Consider When Designing Scientific Investigations?, Activity 2.2: What Do Plants Need to Grow?, Reading 2.2: What Do Plants Need to Grow?, Activity 7.1: What Do Plants Produce in the Light?, Reading 7.1: What Do Plants Produce in the Light?, Activity 7.2: How Do I Know That Plants Use Carbon Dioxide?, Reading 7.2: How Do I Know That Plants Use Carbon Dioxide?, Activity 7.3: What Do Plants Produce in the Light? **Life Science 1:** Activity 4.2: Do Plants Need Food?
MS-LS1-7	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.	**LS1.C, PS3.D**	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. (LS1.C) 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. (PS3.D)	**Introduction to Chemistry 2** - How Can I Make New Stuff From Old Stuff? **Introduction to Chemistry 3** - How Does Food Provide My Body With Energy? **Life Science 1** - Where Have All the Creatures Gone? **Life Science 2** - What is Going On Inside Me?	**Introduction to Chemistry 2:** Focal content is understanding chemical reactions. **Introduction to Chemistry 3:** Reading 1.1: What Happens in My Body When I Run around the School?, Activity 1.2: How Can I Learn More about How Food Provides Energy to My Body?, Reading 1.2: How Can I Learn More about How Food Provides Energy to My Body?, Activity 3.1: Do Different Types of Food Molecules Have the Capacity to Provide the Body with Different Amounts of Energy per Gram?, Reading 3.1: Do Different Types of Food Molecules Have the Capacity to Provide the Body with Different Amounts of Energy?, Activity 3.3: How Much Do I Need to Exercise to Expend the Energy That Different Food Molecules Have the Capacity to Provide to My Body?, Reading 3.3: How Much Do I Need to Exercise to Convert Energy That Different Food Molecules Can Provide to My Body?, Activity 4.1: How Does My Mouth Change Carbohydrates?, Reading 4.1: How Does My Mouth Change Carbohydrates?, Activity 5.1: Where Do Proteins Go When They Are Eaten?, Reading 5.1: What Allows Organisms to Grow?, Activity 5.2: Do Animals and Plants Store Food for Later?, Reading 5.2A Do Animals and Plants Store Food for Later?, Reading 5.2B: Plants Also Store Food Molecules for Long Periods of Time, Reading 8.1: What Can Burning Food Teach Me about Food Providing Energy to My Body?, Activity 9.1: Does a Reaction Similar to Burning Happen in My Cells?, Reading 9.1: Does a Reaction Similar to Burning Happen in My Cells?, Activity 9.2: How Do Food Molecules Provide Plants with Energy?, Reading 9.2A How Do Food Molecules Provide Plants with Energy?, Reading 9.2B: Do Plants Give Off Carbon Dioxide?, Activity 9.3: How Do Food Molecules Provide Energy?, Reading 9.3: How Can I Tell That Food Molecules Provide My Cells with Energy?, Reading 10.3: What Else Is There to Learn about Energy? **Life Science 1:** Activity 3.1: What Do Organisms Use Food For?, Activity 3.2: Investigating What Is in Food, Activity 3.3: Investigation: Can We Prove a Substance Is Food?, Reading 3.3: Energizing Me, Activity 3.4: Writing a Scientific Explanation **Life Science 2:** Activity 4.4: What Happens to the Food Molecules in the Small Intestine?, Activity 5.4: Can Cells Use Sugar as Food?, Activity 6.1: "Breathe in, Breathe out...", Activity 6.3: What is the Motive?
MS-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.	**LS1.D**	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.	**Physical Science 1** – Can I Believe My Eyes? **Introduction to Chemistry 1** - How Can I Smell Things from a Distance?	**Physical Science 1:** Activity 1.1: Anchoring Activity--Strange Images, Reading 1.1: Look at This!, Activity 1.2: Driving Question Board, Activity 2.1: Probing Ideas: Seeing Objects around the Room, Activity 2.2: Determining the Conditions for Sight--The Light Box, Reading 2.2: Picture This!, Activity 4.1: How the Eye Works--Overview, Reading 4.1: Eyes in the Animal Kingdom, Activity 9.3: How Color Sensors Work, Reading 9.3: Making Color Photographs **Introduction to Chemistry 1:** Activity 1.1: Can You Smell What I Smell?, Reading 1.1: Can You Smell What I Smell?, Reading 1.2: How Can Models Help Me Understand Odors?, Reading 6.1: In What Ways Do People Use Detectors?
MS-LS2-1	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an	**LS2.A**	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. (1) Growth of organisms and population increases are limited by access to resources. (2)	**Life Science 1** - Where Have All the Creatures Gone?	**Life Science 1:** Activity 2.1: Introducing the Trout Mystery, Activity 9.1: Exploring the NetLogo Model Ecosystem, Homework 9.2: Interpreting NetLogo Graphs
MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	**LS2.A**	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** - Where Have All the Creatures Gone? **Life Science 2** - What is Going On Inside Me? **Life Science 3** - Why Do Organisms Look the Way They Do?	**Life Science 1:** Activity 1.1: Interactions in Our World, Reading 1.1: Bacteria, Chimps, Peanuts, and Dolphins, Activity 1.2: Field Study, Homework 1.2: What Can Cause Populations to Change?, Activity 1.3: Setting Up the Driving Question Board, Reading 1.3: Wildlife Biologists at Work, Activity 6.1: Investigating the Sea Lamprey Background, Reading 6.2: There Are a Lot of Lamprey Out There!, Activity 7.3: Constructing a Scientific Explanation, Activity 9.2: Can All Three Populations Survive?, Reading 9.2: A Stable Ecosystem in the Park **Life Science 2:** Reading 4.4: Out with the Bad, In with the Good! **Life Science 3:** Homework 8.2: Who Uses Social Networks More?

Activate Learning

IQWST Units, Lessons, and Activities Aligned to NGSS Performance Expectations

Performance Expectation	PE Description	Disciplinary Core Ideas	DCI Descriptions	Addressed in IQWST Unit(s)	Activities and Readings
MS-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**	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. 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** - How Does Food Provide My Body With Energy? **Life Science 1** - Where Have All the Creatures Gone?	**Introduction to Chemistry 3:** Activity 10.1: How Does Matter Transfer between Organisms?, Reading 10.1: How Does Matter Transfer between Organisms?, Activity 10.2: How Does Energy Move between Organisms?, Reading 10.2: How Does Energy Flow through the Environment?, Activity 10.3: How Can the Flow of Matter and Energy Change? **Life Science 1:** Activity 4.1: Where Do Animals Get the Energy and Building Materials They Need?, Homework 4.2: What Do Trout Eat?, Activity 5.1: Food Chains and Food Webs, Activity 6.2: Adding the Sea Lamprey to the Great Lakes Food Web
MS-LS2-4	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	**LS2.C**	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** - Where Have All the Creatures Gone?	**Life Science 1:** Reading 2.1: What Caused These Population Changes?, Reading 5.1: Where Have All the Puffin Gone?, Activity 5.2: Changes in a Food Web, Reading 5.2: Fisherman's Journal, Activity 9.3: How Does an Invasive Species Affect a Food Web?, Homework 9.3: What Does the Invader Eat?, Reading 9.3: An Invader in Yellowstone National Park, Activity 10.1: How Does the Sea Lamprey Affect the Trout?, Activity 11.1: Worms and Moisture, Activity 13.1: What Is Causing the Trout to Change?, Activity 13.2: What Is Causing this Population Change?
MS-LS2-5	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	**LS2.C, LS4.D, ETS1.B**	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. (LS2.C) 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. (LS4.D) There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (ETS1.B)	**Life Science 1** - Where Have All the Creatures Gone?	**Life Science 1:** Focal content of the unit is ecosystems. **Concept Builder:** Human Impacts on Earth's Systems
MS-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, LS3.B**	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. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits (LS3.A)In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. 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. (LS3.B)	**Life Science 3** - Why Do Organisms Look the Way They Do?	**Life Science 3:** Reading 3.3: Heredity Patterns--A Key to Diagnosis, Homework 3.3: Heredity Patterns--A Key to Diagnosis, Activity 6.1: Constructing a Model of Inheritance, Activity 6.2: Testing the Model, Reading 6.2: Models: Using Models to Decide between Possible Explanations, Activity 7.1: Extending and Applying the Model of Inheritance, Activity 7.2: Introducing Albinism, Reading 7.2: Which Instructions Get Followed?, Activity 8.4: How Do Genes work for Continuous Traits?, Reading 8.4: Height--Unraveling a Genetic Puzzle
MS-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, LS3.A, LS3.B**	Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.(LS1.B) Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.(LS3.A) 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. (LS3B)	**Life Science 3** - Why Do Organisms Look the Way They Do?	**Life Science 3:** Activity 1.1: What Traits Do Humans Have?, Activity 1.2: Traits of You and Me, Activity 1.3: Baby, Where Did You Get Those Eyes?, Reading 1.3: Baby, Where Did You Get Those Eyes?, Activity 2.1: Are Traits Connected?, Reading 2.1: Do the Traits I Inherited Affect My Sense of Taste or Smell?, Reading 2.2: What Is the Buzz About?, Activity 2.3: Is There a Pattern to How Traits Get Passed On?, Activity 3.1: What Are the Patterns in How Traits Are Inherited?, Activity 3.2: Are There Patterns in Plant Traits?, Activity 3.3: What Seed Patterns Are There in a Future Generation?, Activity 4.1: How Do Traits Get Passed On?, Activity 4.2: What about the Next Generation of Seeds?, Activity 4.3: Synthesizing the Data, Reading 4.3: Why Are Patterns Important?, Activity 5.2: How Can Parents Produce Offspring with Different Traits?, Reading 5.2: Discovering the Source, Activity 8.3: Variation Everywhere, So What?
MS-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 operate today as in the past.	**LS4.A**	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.	**Earth Science 1** – How Does Water Shape Our World? **Earth Science 3** - How is the Earth Changing?	Earth Science 1: Activity 11.1: Making New Rock from Old Rock, Activity 11.2: How Else Can You Make New Rock? , Reading 11.2: Cooling the Lava, Activity 11.3: Can You Make Rock Stronger Without Melting It?, Activity 12.1: Cycling Rock, Reading 12.1: Sea Creatures on Mountains?, Activity 12.2: What Types of Rock Are in My Park?, Reading 12.2: Hoodoos: How Do You Do?, Activity 12.3: How Does Rock Type Affect Landforms? Earth Science 3: Activity 2.1: The Theory of Continental Drift, Reading 2.1: What Is Continental Drift? Activity 2.2: The Exploration of the Ocean Floor, Activity 3.1: The Theory of Plate Tectonics Concept Builder: Macroevolution
MS-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 evolutionary relationships.	**LS4.A**	Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent.	**Life Science 1** - Where Have All the Creatures Gone?	**Life Science 1:** Activity 7.1: Investigating the External Structures of the Sea Lamprey and the Yellow Perch, Activity 7.2: Investigating the External Structures of the Sea Lamprey and the Yellow Perch, Activity 8.1: Structures and Functions for Meeting Survival Needs **Concept Builder:** Macroevolution

Activate Learning

IQWST Units, Lessons, and Activities Aligned to NGSS Performance Expectations

Performance Expectation	PE Description	Disciplinary Core Ideas	DCI Descriptions	Addressed in IQWST Unit(s)	Activities and Readings
MS-LS4-3	Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.	**LS4.A**	Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent.	**Concept Builder:** Macroevolution	**Concept Builder:** Macroevolution
MS-LS4-4	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	**LS4.B**	Natural selection leads to the predominance of certain traits in a population, and the suppression of others.	**Life Science 3** - Why Do Organisms Look the Way They Do?	**Life Science 3:** Activity 9.1: The Case of the Peppered Moth, Reading 9.2: How Does Variation Matter?, Activity 10.1: Background to the Mystery, Activity 10.2: Introducing Data Comparisons and Individual Finch Data, Activity 10.3: Investigating the Finches, Reading 10.3: Where Did the Data Come From?, Activity 10.4: Midpoint Sharing, Activity 10.5: Sharing Ideas, Homework 10.5: What Happens Next?, Activity 11.1: Constructing a General Model of How Populations Can Change, Activity 11.2: Does the Consensus Model work?, Activity 11.3: Putting It All Together--Why Do Organisms Look the Way They Do? **Concept Builder:** Macroevolution
MS-LS4-5	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.	**LS4.B**	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 on to offspring.	**Life Science 3** - Why Do Organisms Look the Way They Do?	**Life Science 3:** Reading 11.1: Does Selection Always Occur Naturally? **Concept Builder:** Macroevolution
MS-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 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** - Why Do Organisms Look the Way They Do?	**Life Science 3:** Activity 9.2: How Does Variation Matter?, Activity 9.3: Explaining the Change in the Peppered Moth Population **Concept Builder:** Macroevolution
MS-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, and seasons.	**ESS1.A, ESS1.B**	Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.(ESS1.A) This model of the solar system can explain 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. (ESS1.B)	**Earth Science 2** – What Makes the Weather Change? **Physical Science 1** - Can I Believe My Eyes?	**Earth Science 2:** Activity 7.3: Does the Earth's Shape Affect Temperature?, Activity 7.4: Does the Angle That Light Hits the Earth Affect Intensity?, Activity 7.5: Can We Explain the Pattern in the Data?, Reading 8.2: Day and Night, Activity 8.3: Does a Tilted Earth Explain the Seasons?, Reading 8.3: Seasons of the Year, Activity 8.4: Why Is the Temperature Not the Same Everywhere? **Physical Science 1:** Reading 6.4: Moon Phases, 7.1 Warm Up Activity, Reading 10.2: Lunar and Solar Eclipses, Reading 11.2: Solar Eclipses **Concept Builder:** Earth and Space Science
MS-ESS1-2	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.	**ESS1.A, ESS1.B**	Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (ESS1.A) The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.(1) The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (ESS1.B)	**Physical Science 3** - How Will it Move?	**Physical Science 3:** Reading 7.2: Planetary Motion **Concept Builder:** Earth and Space Science
MS-ESS1-3	Analyze and interpret data to determine scale properties of objects in the solar system.	**ESS1.B**	The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them.	**Physical Science 1** – Can I Believe My Eyes? **Physical Science 3** - How Will it Move?	**Physical Science 1:** Reading 5.3: Stars and the Solar System **Physical Science 3:** Reading 6.3: The Universe **Concept Builder:** Earth and Space Science
MS-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 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** – How is the Earth Changing?	**Earth Science 3:** Activity 2.1: The Theory of Continental Drift **Concept Builder:** Earth and Space Science
MS-ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.	**ESS2.A**	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 1** – How Does Water Shape Our World? **Earth Science 3** – How is the Earth Changing?	**Earth Science 1:** Activity 11.1: Making New Rock from Old Rock, Activity 11.2: How Else Can You Make New Rock?, Reading 11.2: Cooling the Lava, Activity 11.3: Can You Make Rock Stronger Without Melting It?, Activity 12.1: Cycling Rock, Activity 12.2: What Types of Rock Are in My Park? **Earth Science 3:** Activity 4.2: Silly Putty. Rocks. Reading 4.2: Formation of Metamorphic Rock, Activity 5.2: Two Types of Rock Comprise Plates, Activity 8.1: How Does the Earth Cycle Rock Material?, Activity 9.3: Building Physical Models **Concept Builder:** Human Impacts on Earth's Systems

Activate Learning

IQWST Units, Lessons, and Activities Aligned to NGSS Performance Expectations

Performance Expectation	PE Description	Disciplinary Core Ideas	DCI Descriptions	Addressed in IQWST Unit(s)	Activities and Readings
MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.	**ESS2.A, ESS2.C**	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.(ESS2.A) Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (ESS2.C)	**Earth Science 1** – How Does Water Shape Our World? **Earth Science 3** – How is the Earth Changing?	**Earth Science 1:** Activity 1.1: How Natural Compares to Man Made, Activity 1.2: Investigating Landforms, Activity 1.3: How Does Home Compare?, Activity 2.1: Making Sense of the Task, Reading 2.1: Landforms on Earth, Activity 2.2: Developing the Driving Question Board, Activity 7.1: How Does Flowing Water Affect Earth? Reading 7.1: How Long Does It Take a River to Form?, Homework 7.1: Could Water Have Shaped the Grand Canyon?, Activity 8.1: How Do Rocks Break Down?, Reading 8.1: What Causes Rock to Break into Pieces?, Activity 8.2: How Does Moving Water Carry Particles?, Activity 8.3: What Happens to the Pieces of Rock that Are Weathered and Eroded?, Reading 8.3: Flooding the Canyon, Activity 9.1: Investigating Stream Tables, Reading 9.1: Landslides and Erosion, Activity 10.1: How Does Water Shape the Landforms in the Case Study Parks?, Activity 10.2: How Does Water Shape the Landforms in Our Park?, Reading 10.2: What Is Sand?, Activity 13.1: Putting Together the Answer, Activity 13.2: Group Presentations **Earth Science 3:** Activity 1.1: Worldwide Pattern of Volcanoes, Activity 1.2: Worldwide Pattern of Earthquakes, Activity 1.3: Earthquakes, Volcanoes, and World Elevation, Activity 5.1: What Happens When Plates Move?, Reading 5.1: Ring of Fire, Activity 6.1: Volcano Formation, Activity 6.2: Hotspot Formation, Reading 6.2: Is a Hotspot Lurking Beneath the Continental United States?
MS-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.	**ESS2.B, ESS1.C**	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. (ESS2.B) Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (ESS1.C)	**Earth Science 3** – How is the Earth Changing?	**Earth Science 3:** Reading 2.1: What Is Continental Drift?, Activity 2.2: The Exploration of the Ocean Floor, Activity 3.1: The Theory of Plate Tectonics, Activity 7.1: Determining Plate Movement, Activity 9.1: Creating a List of Important Ideas and Annotating a Cross Section of Earth, Reading 9.1: How Well Do Scientists Understand Plate Tectonics?, Activity 9.2: Filling Out the Summary Chart, Activity 10.1: Exploration of Case Study Sites, Reading 10.1: How Are Case Studies Useful?, Activity 10.2: Scientific Explanation of One Site
MS-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.	**ESS2.C**	Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (1) Global movements of water and its changes in form are propelled by sunlight and gravity.(2)	**Earth Science 1** – How Does Water Shape Our World? **Earth Science 2** – What Makes the Weather Change? **Introduction to Chemistry 1** - How Can I Smell Things From a Distance?	**Earth Science 1:** Activity 3.1: Where Is Water on the Map?, Activity 3.4: How Do the Reservoirs Compare?, Activity 4.1: How Does Water Move over the Surface?, Activity 4.2: Can Maps Help Figure Out Flow?, Reading 4.2: Down the Drain!, Activity 4.3: How Does Water Move into the Ground?, Activity 5.1: Water Cycle Simulation: What Is It Like to Be a Water Molecule?, Activity 5.2: Can Maps Help Figure Out Flow?, Homework 5.2: My Life as a Water Molecule, Activity 6.1: Does Water Cycle Work in Case Parks?, Reading 6.1: I Think I Have Seen This Water Before, Activity 6.2: How Does the Water Cycle Work in Our Park? **Earth Science 2:** Activity 4.3: Is a Storm Cloud Different from Other Clouds? **Introduction to Chemistry 1:** Activity 13.1: What Happens to Bromine as it is Cooled or Heated?, Reading 13.1: How Do Substances Become Part of the Air?, Activity 13.2: Modeling the Bromine Tube, Activity 13.3: What Happens When Water Boils?, Activity 13.4: Where Did the Water Come From?, Reading 13.4: Where Do Drops of Water Come From?, Reading 15.1: What Happens to Molecules When a Substance Melts?, Reading 15.2: How Can I Smell
MS-ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.	**ESS2.C, ESS2.D**	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. (ESS2.C) Because these patterns are so complex, weather can only be predicted probabilistically. (ESS2.D)	**Earth Science 1** – How Does Water Shape Our World? **Earth Science 2** – What Makes the Weather Change?	**Earth Science 1:** Activity 3.2: Is There Water in the Air?, Reading 3.2: How Do I Know How Humid It Is? **Earth Science 2:** Activity 1.2: Setting Up the Driving Question Board (DQB), Reading 1.2: What Can Clouds Tell Us about Weather?, Activity 2.1: It Is Heating Up, Activity 4.1: Constructing a Barometer, Activity 4.2: Does How Large the Difference in Temperature between Air Masses Affect How the Air Moves?, Activity 5.1: What Can Weather Maps Tell Us?, Reading 5.1: How Do Scientists Get the Data?, Activity 5.2: Creating an Isobar Map, Activity 6.1: Can We Identify Patterns in Data?, Activity 6.2: Can the Storm Model Explain the Data?, Reading 6.2: Is It Going to Snow or Rain or...?
MS-ESS2-6	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.	**ESS2.C, ESS2.D**	Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.(ESS2.C) 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.(1) 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. (ESS2.D)	**Earth Science 1** – How Does Water Shape Our World? **Earth Science 2** – What Makes the Weather Change?	**Earth Science 1:** Activity 4.4: How Does Water Move In and Out of the Atmosphere? **Earth Science 2:** Activity 1.1: Identifying Weather Conditions around the World, Activity 7.1: How Can We Compare Cities on Earth?, Activity 7.2: Do the Number of Daylight Hours Vary in Different Locations on Earth?, Homework 7.5: Does the Data Match the Explanation?, Activity 8.1: Does the City Data Match the Visualizations?, Activity 8.2: How Does the Earth Move?
MS-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**	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.	**Earth Science 1** – How Does Water Shape Our World?	**Earth Science 1:** Activity 3.3: Where Else Is Water Found?, Reading 3.3: What Is a Glacier? **Concept Builder:** Human Impacts on Earth's Systems
MS-ESS3-2	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.	**ESS3.B**	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** – How is the Earth Changing?	**Earth Science 3:** Reading 1.2: Volcanoes and Earthquakes
MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	**ESS3.C**	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** - Where Have All the Creatures Gone?	**Life Science 1:** Reading 11.1: When More Is Too Much **Concept Builder:** Human Impacts on Earth's Systems
MS-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.	**ESS3.C**	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** - Where Have All the Creatures Gone? **Earth Science 3** – How is the Earth Changing?	**Life Science 1:** Reading 11.1: When More Is Too Much, Activity 12.1: Analyzing Dioxin Data, Reading 12.1: Return of the Green Goo **Earth Science 3:** Reading 8.1: Recycling for Earth and Cycling within Earth **Concept Builder:** Human Impacts on Earth's Systems

Activate Learning

IQWST Units, Lessons, and Activities Aligned to NGSS Performance Expectations

Performance Expectation	PE Description	Disciplinary Core Ideas	DCI Descriptions	Addressed in IQWST Unit(s)	Activities and Readings
MS-ESS3-5	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	**ESS3.D**	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** - How Can I Make New Stuff From Old Stuff? **Life Science 1** - Where Have All the Creatures Gone?	**Introduction to Chemistry 2:** Reading 8.1: Why Is the Statue of Liberty Green?, Reading 8.2: Does Acid Rain Make New Substances? **Life Science 1:** Activity 12.1: Analyzing Dioxin Data, Reading 12.1: Return of the Green Goo **Concept Builder:** Human Impacts on Earth's Systems
ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people	**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 are likely to limit possible solutions.	The **Engineering Design Concept Builder** is designed to address the four Performance Expectations described in the Engineering and Design standards of the Framework for K-12 Science Education and the Next Generation Science Standards. The supplement includes one activity designed to correspond with each of the 12 IQWST units. Each supplemental engineering activity addresses Scientific Principles that students have learned in the corresponding unit, so that activities may be integrated into current IQWST teaching and learning. The supplemental engineering activities could also be used independently. Each of the 12 activities in the supplement addresses one or more of the Engineering and Design standards such that all four standards are addressed multiple times by users of the entire supplement for grades 6-8. In addition to the Engineering Design Concept Builder, engineering activities have always been included in several of the IQWST units. For example, in a physics unit, students design a Rube Goldberg machine (PS2) in order to apply their understandings of energy transfer, transformation, and conservation to a design task. In the same unit, students build and test a battery. In a chemistry unit (IC2), students make their own soap and have the opportunity to improve their soap in ways that are safe and manageable in a classroom context (e.g., make it smell more appealing). In a life science unit (LS1), students evaluate possible solutions to the problem of an invasive species. In the original IQWST lessons, the language of "criteria" and "constraints" is not specifically used, nor is iterative testing a requirement (it is optional depending on time constraints and learning goals). However, that language and related engineering processes can easily be introduced by the teacher into activities already found in the units.	
ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem	**ETS1.B:**	Developing Possible Solutions There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.		
ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	**ETS1.B** **ETS1.C**	ETS1.B: Developing Possible Solutions 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. 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 those characteristics may be incorporated into the new design.		
ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	**ETS1.B** **ETS1.C**	ETS1.B: Developing Possible Solutions 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. 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 those characteristics may be incorporated into the new design.		