HIGH SCHOOL SCOPE & SEQUENCE

September 2021

Overview

This document contains a description of the OpenSciEd High School Program Scope and Sequence. The scope and sequence articulates how the high school program is organized in bundles of performance expectations used to design a target unit, how the ideas in each unit build on prior ideas, and how the three dimensions of NGSS are reflected in these PE bundles.

Course Sequence

This OpenSciEd High School scope and sequence proposes both an order for courses and content within courses. The order of courses reflects

a) a purposeful consideration of how to build disciplinary core ideas (DCIs), science and engineering practices (SEPs), and crosscutting concepts (CCCs); and
b) market considerations (i.e., the most common ordering of courses across schools and districts).

In the OpenSciEd sequence, students would begin by taking biology, then chemistry, and then physics. Earth and space science is integrated throughout. This is informed by the most common ordering of courses across the country. Each course will provide students with multiple opportunities to engage with DCIs, SEPs, and CCCs targeted in the performance expectations, with scaffolding fading over the course of the year in each dimension. All the performance expectations in high school science, including the engineering standards, are included within the three year sequence.

In unpacking the Performance Expectations (PEs) across the content areas you will see that:

- The target DCIs in High School Biology draw on Middle School Physical Science DCIs.
- Organizing DCI elements into a coherent learning progression led to placing a number of these elements typically found in chemistry courses (e.g., atomic structure, inter and intramolecular forces) before elements typically found in physics courses (e.g., electromagnetic radiation). That is why chemistry is taught before physics.

Because the physical science (PS) performance expectations include both chemistry and physics content, these PEs are divided across different courses. Considerations for how these were divided includes:

(a) which ideas were foundational for subsequent learning;
(b) advice from state and district science coordinators and high school teachers.

The division reflects both a coherent learning argument and current market preference.

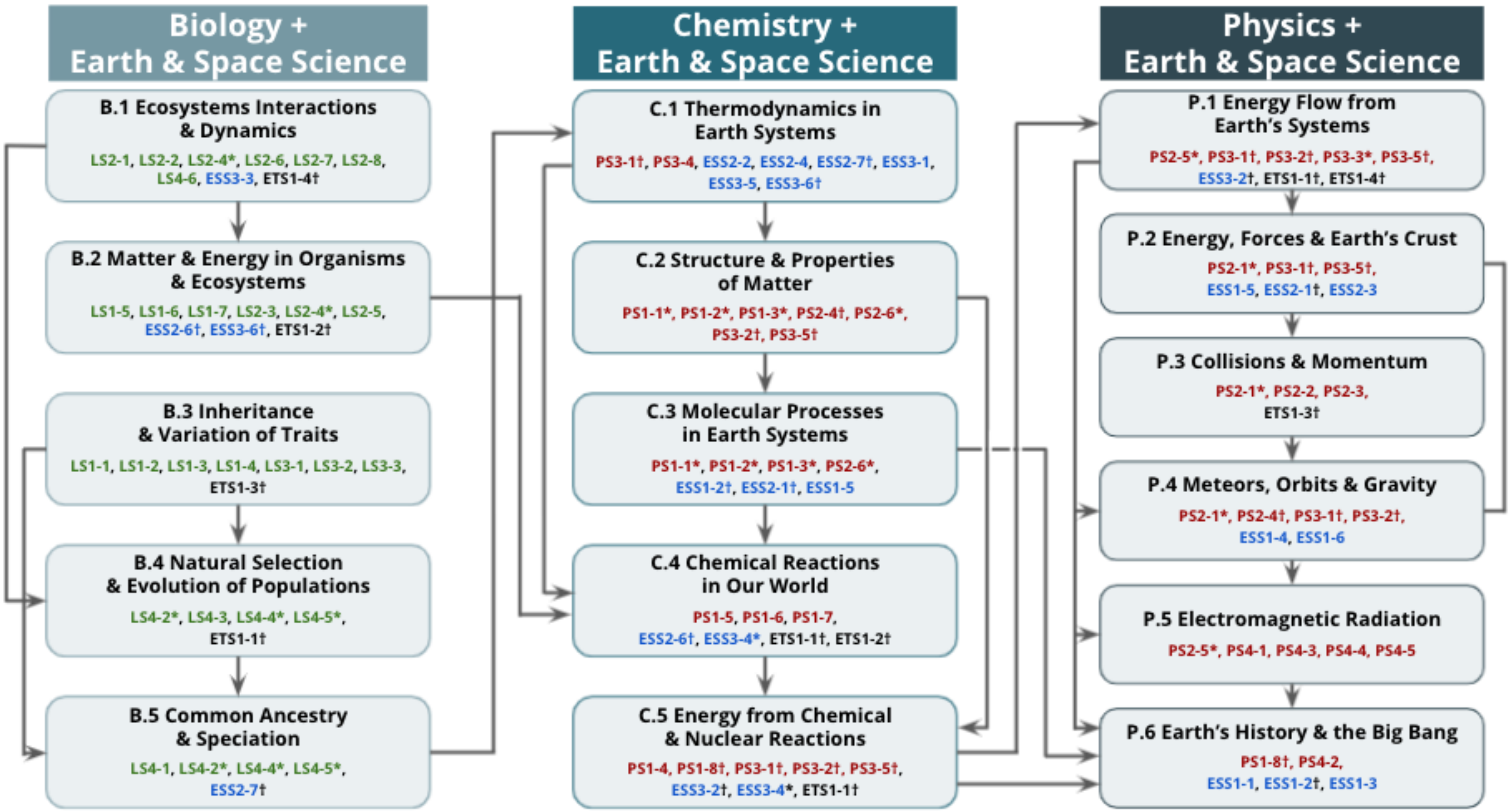
Unit Scope and Sequence within Courses

The bundling of PEs was based on consultation with science teachers and leaders. For each bundle, anchoring phenomena have been identified by gathering interest data from a diverse student population.

The integration of earth and space science (ESS) and engineering (ETS) standards was thoughtfully considered. The PEs bundled within units were identified as having the potential of working synergistically with and/or supporting students in deepening three dimensional understandings of life and physical science PEs in each course.

Note: As part of OpenSciEd development, all units are being field tested and phenomena may be revised or changed altogether based upon teacher and student feedback. What is presented below is the current working draft that will be updated.

OpenSciEd HIGH SCHOOL SCOPE & SEQUENCE

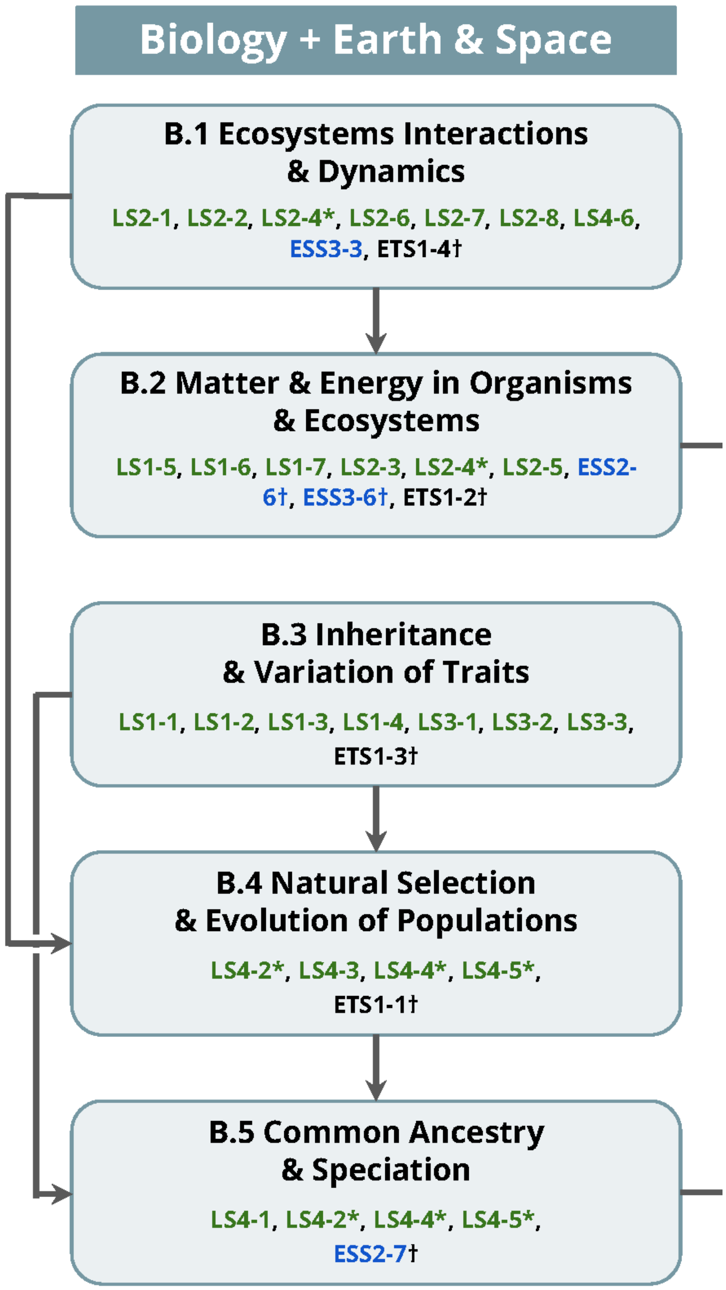


*PE built across units †PE build across courses

Life Science PE / Physical Science PE / Earth & Space PE / **Engineering PE**

Updated September 2021

Biology + Earth and Space Course Scope and Sequence



*PE built across units †PE built across courses Life Science PE / Physical Science PE / Earth & Space Science PE / Engineering PE

Biology + ESS
Performance Expectations by Unit

Unit B.1

Big Ideas: *Ecosystems: Interactions and Dynamics*

Unit Question: What are the benefits and burdens of being part of a complex ecosystem?

In this unit students figure out big ideas related to energy flow in ecosystems, carrying capacity and interactions including group behavior. They investigate the importance of biodiversity and how human interactions affect natural systems.

Performance Expectations

HS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-4* Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS2-8 Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

HS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

HS-ESS3-3 Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

HS-ETS1-4† Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Unit B.2

Big Ideas: *Ecosystems: Matter and Energy*

Unit Question: TBD

In this unit, students focus on the flow of energy and matter through the carbon cycle considering the mechanisms of cellular respiration and photosynthesis at various scales. They consider how humans can develop solutions to reduce their impacts on natural systems.

Performance Expectations

HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

HS-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

HS-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

HS-LS2-4* Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

HS-LS2-5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

HS-ESS2-6† Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

HS-ESS3-6† Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

HS-ETS1-2† Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Unit B.3

Big Ideas: *Inheritance and Variation of Traits*

Unit Question: TBD

Students figure out the role DNA and chromosomes play in human inheritance, how new variations are introduced into populations and how traits are distributed in populations. They investigate how variation leads to differences between individuals at cellular and system levels by disputing and maintaining stable states.

Performance Expectations

HS-LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.

HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS-LS1-4 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

HS-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

HS-ETS1-3† Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit B.4

Big Ideas: *Natural Selection and Evolution of Populations*

Unit Question: TBD

In this unit, students investigate evolution by natural selection and apply these ideas to populations. Students use these understandings to propose a solution to a global problem related to change in populations over time.

Performance Expectations

HS-LS4-2* Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment .

HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait

HS-LS4-4* Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-LS4-5* Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

HS-ETS1-1† Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Unit B.5

Big Ideas: *Common Ancestry and Speciation*

Unit Question: TBD

In this unit students use their understanding of evolution through natural selection to explore the evidence for common ancestry and figure out how Earth's systems and life co-evolved. They investigate speciation and extinction through this lens.

Performance Expectations

HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

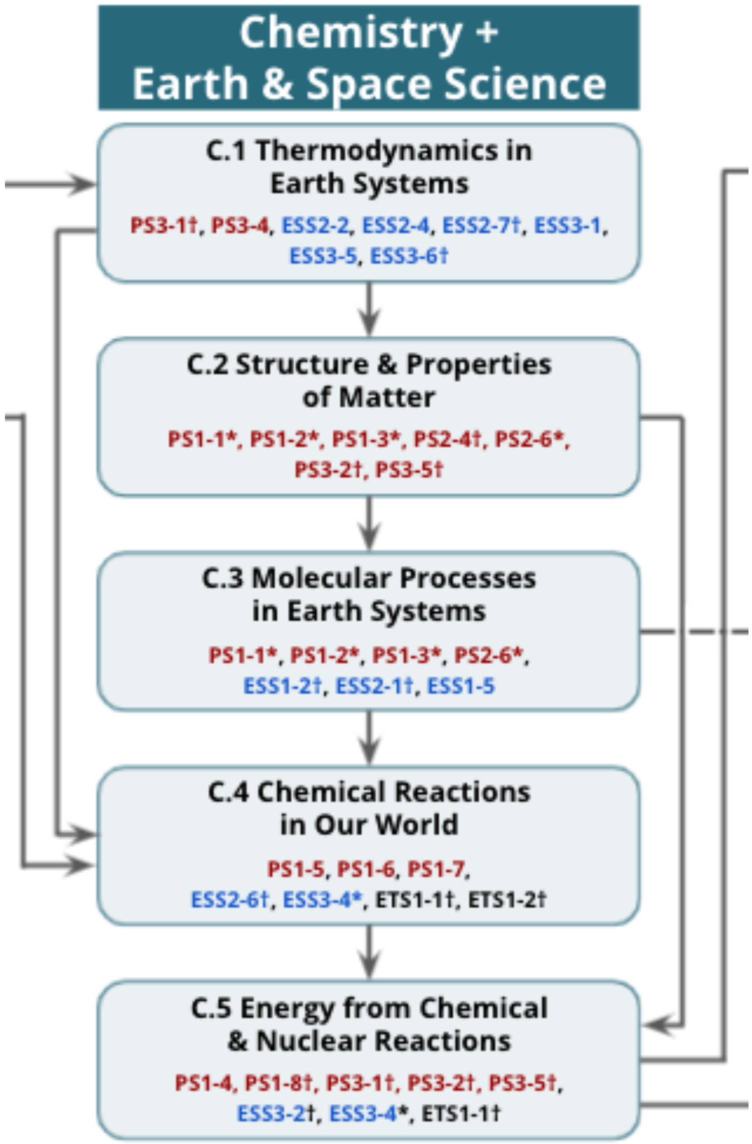
HS-LS4-2* Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment .

HS-LS4-4* Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-LS4-5* Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

HS-ESS2-7† Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

Chemistry + Earth and Space Course Scope and Sequence



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Chemistry + ESS
Performance Expectations by Unit

Unit C.1

Big Ideas: *Thermodynamics in Earth Systems*

Unit Question: How can we slow the flow of energy on Earth to protect vulnerable coastal communities?

In this unit, students investigate the particulate nature of matter and the behavior of water and energy to explain how polar ice changes are affecting communities. Students figure out how energy transfers on the molecular level as well as on the Earth-systems level through radiation, convection, and conduction. They reconstruct Earth's climate history to create a model of how positive feedback loops can trigger relatively abrupt changes in the climate system; while negative feedback loops can help maintain relatively stable climate conditions.

Performance Expectations

HS-PS3-1† Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

HS-PS3-4 Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

HS-ESS2-2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

HS-ESS2-7† Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

HS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

HS-ESS3-5 Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts on Earth systems

HS-ESS3-6† Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Unit C.2

Big Ideas: *Structure & Properties of Matter*

Unit Question: TBD

In this unit, students revise their model of matter at the particle level. They develop the understanding that all atoms are made of charged particles and some types of atoms give up one kind of charged particle (an electron) more readily than others. They explore the electrostatic behavior of macroscopic objects to understand how changes in position and motion of charged objects (and particles) affect the forces between them and cause energy transfer to and from their electric fields.

Performance Expectations

HS-PS1-1* Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

HS-PS1-2* Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS-PS1-3* Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS2-4† Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

HS-PS2-6* Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

HS-PS3-2† Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

HS-PS3-5† Develop and use a model of two objects interacting through electrical or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

Unit C.3

Big Ideas: *Molecular Processes in Earth Systems*

Unit Question: TBD

This unit on the structure and properties of matter focuses on the properties of substances and how they interact with other substances, including charges on atoms and molecules as well as patterns of bonding. Students map these patterns of bonding to trends on the periodic table, and investigate how patterns of bonding give water special properties on the molecular and bulk scale to account for how water can shape land forms over a variety of time scales.

Performance Expectations

HS-PS1-1* Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

HS-PS1-2* Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS-PS1-3* Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS2-6* Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

HS-ESS1-2† Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

HS-ESS2-1† Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

HS-ESS2-5 Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

Unit C.4

Big Ideas: *Chemical Reactions in our World*

Unit Question: TBD

In this unit, students develop models of the changing dynamic equilibrium in a chemical reaction. Students investigate how mass is conserved in chemical reactions and how adding a disturbance to a chemical equilibrium system can shift the equilibrium of the system. They explain how the products of chemical processes are interacting with and affecting different spheres on Earth. Finally, students create an engineering design solution using the principle of chemical equilibrium.

Performance Expectations

HS-PS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

HS-PS1-6 Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

HS-ESS2-6† Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

HS-ESS3-4* Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

HS-ETS1-1† Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2† Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Unit C.5

Big Ideas: *Energy from Chemical and Nuclear Reactions*

Unit Question: TBD

In this unit, students investigate how rearrangements of matter in chemical reactions can absorb or release energy to the surroundings of the reaction. Students build and refine particle level models for how rearrangement of atoms, attractive and repulsive forces, and electrostatic fields between atoms lead to energy changes at the macroscopic scale that result in endothermic and exothermic processes. Students evaluate multiple different solutions for a problem of how society could use alternate fuels, including nuclear, to provide its energy needs.

Performance Expectations

HS-PS1-4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

HS-PS1-8† Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

HS-PS3-1† Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

HS-PS3-2† Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

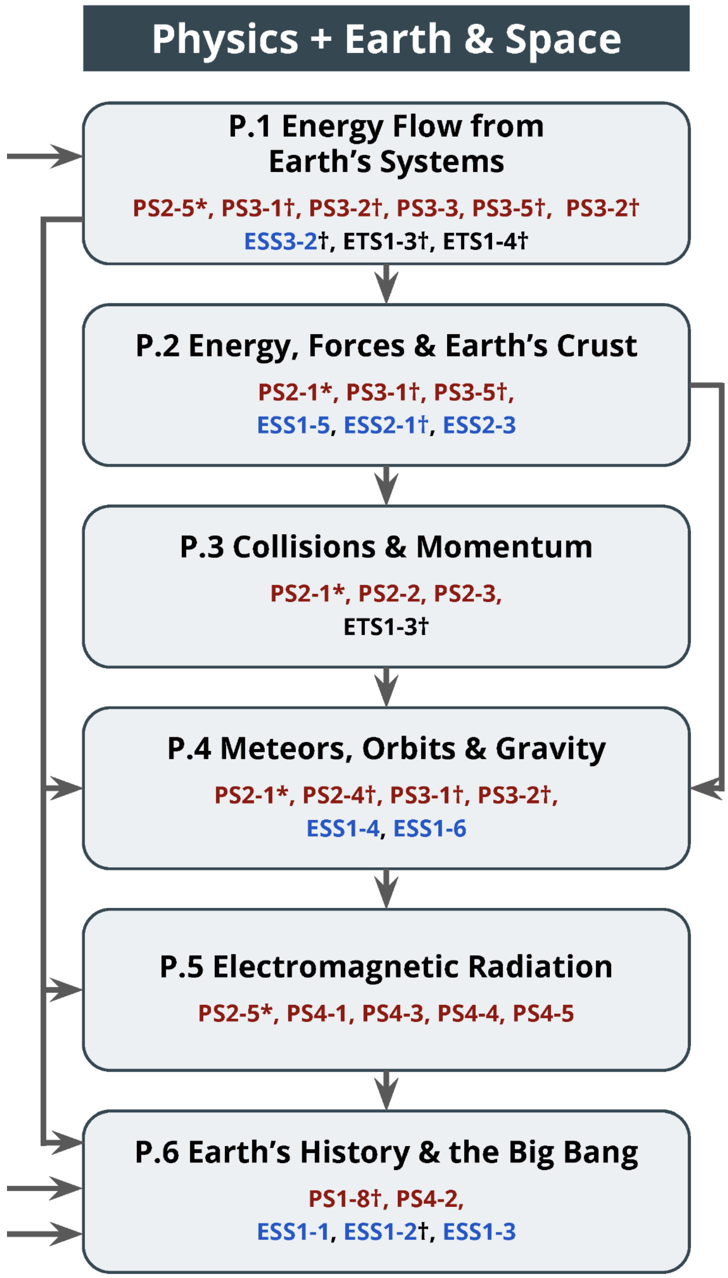
HS-PS3-5† Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

HS-ESS3-2† Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.*

HS-ESS3-4* Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*

HS-ETS1-1† Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants

Physics + Earth and Space
Course Scope and Sequence



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Physics + ESS
Performance Expectations by Unit

Unit P.1

Big Ideas: *Energy Flow from Earth's Systems*

Unit Question: How can we design more reliable systems to meet our communities' energy needs?

In this unit, students will explain how humans use machines to transfer energy out of Earth's four systems, and into our communities. Students will consider the tradeoffs inherent in making engineering decisions about electricity generation for communities around the world, including distribution of resources (both natural and economic), and think critically about inequitable distribution. As part of these tradeoffs, we will consider how we weigh these decisions, and hear both western and indigenous perspectives on what should weigh more heavily. Students will develop models to describe energy flow through systems both on paper, and using software (like Sage Modeler) to understand how the decisions humans make change energy flow into our communities and homes.

Performance Expectations

HS-PS2-5* Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

HS-PS3-1† Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

HS-PS3-2† Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).

HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

HS-PS3-5† Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

HS-ESS3-2† Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

HS-ETS1-1† Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants

HS-ETS1-4† Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Unit P.2

Big Ideas: *Energy, Forces & Earth's Crust*

Unit Question: TBD

In this unit, students will look more closely at one of Earth's systems: the geosphere. We will consider the energy flow through this system through convection and motion, with a focus on the distinction between energy that is transferring very slowly over millions of years, and sudden energy transfers like earthquakes. To explain these sudden transfers of energy, we will develop a new framework for understanding why energy transfers: balanced and unbalanced forces. We will model various plate interactions using force diagrams, and consider the value of using energy and forces to describe interactions.

Performance Expectations

HS-PS2-1* Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS3-1† Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known

HS-PS3-5† Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

HS-ESS1-5 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

HS-ESS2-1† Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

HS-ESS2-3 Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

Unit P.3

Big Ideas: *Collisions & Momentum*

Unit Question: TBD

In this unit, students will take the energy and forces frameworks we developed in an Earth Science context, and consider how a generalization of these ideas (Newton's laws) can help us solve a problem related to collisions and safety. This may be in the context of cars, helmets, or something else. Students will use conservation of momentum to inform the design of a device that minimizes force. They will move through at least one full engineering design cycle as they refine these devices.

Performance Expectations

HS-PS2-1† Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS2-2† Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

HS-PS2-3† Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

ETS1-3† Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit P.4

Big Ideas: *Meteors, Orbits & Gravity*

Unit Question: TBD

Students will consider the impact that rocks from space have on Earth. They will trace these rocks back into the solar system, and use our forces framework to try to describe their motion in order to predict if they might impact Earth. As part of this unit we will highlight the humanity of science, including scientific joy (like when a scientist discovers a meteor), and what motivates scientists (like protecting humanity), and how people around the world and throughout history have contextualized, understood, and found meaning in rocks from space.

Performance Expectations

HS-PS2-1* Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS2-4† Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

HS-PS3-1† Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

HS-PS3-2† Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

HS-ESS1-4 Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.

Unit P.5

Big Ideas: *Electromagnetic Radiation*

Unit Question: TBD

Students wonder how a microwave oven heats food, and why it does so differently than other kinds of cooking devices. They will explore wave behavior, and review conduction. They will explain how interference causes uneven heating and use both a photon and wave model to understand a microwave's quirks. We will consider whether or not microwave radiation is dangerous, and use what we learn to explain the relative risks of other kinds of radiation.

Performance Expectations

HS-PS2-5* Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

HS-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

HS-PS4-3 Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

HS-PS4-4 Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

HS-PS4-5 Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Unit P.6

Big Ideas: *Earth's History & the Big Bang*

Unit Question: TBD

Students consider signals from space, and how these signals can teach us things that are unfathomably far away. We consider our relationship within the Universe, making strong connections to indigenous cosmologies, and highlighting the vital importance of learning from mistakes, and embracing uncertainty. We trace some of the signals we receive back to rewind to the beginning of the Universe, and then follow that story in fast forward to explain the flow of energy and matter toward the creation of the Earth itself, and the existence of the Earth systems we have been exploring since the first unit (P.1).

Performance Expectations
HS-PS1-8† Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
HS-PS4-2 Evaluate questions about the advantages of using a digital transmission and storage of information.
HS-ESS1-1 Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
HS-ESS1-2† Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
HS-ESS1-3 Communicate scientific ideas about the way stars, over their life cycle, produce elements.