

# Physical Science - Integrated: Grades 9, 10, 11, 12

Adopted 2018

## Elements, Matter, and Interactions

- PSI-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. [PSI-PS1-1](#)
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- PSI-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. [PSI-PS1-2](#)
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- PSI-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. [PSI-PS1-3](#)
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- PSI-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. [PSI-PS1-4](#)
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- PSI-PS1-7.** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. [PSI-PS1-7](#)
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- PSI-ESS2-7.** Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. [PSI-ESS2-7](#)

## Matter in Organisms

- PSI-LS1-5.** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. [PSI-LS1-5](#)
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- PSI-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. [PSI-LS1-7](#)
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- PSI-LS2-4.** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. [PSI-LS2-4](#)
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- PSI2-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. [PSI2-ETS1-2](#)

## Forces and Motion

- PSI-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. [PSI-PS2-1](#)
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- PSI-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. [PSI-PS2-3](#)
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- PSI-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. [PSI-PS2-5](#)
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- PSI-PS2-6.** Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. [PSI-PS2-6](#)
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- PSI-ESS1-5.** Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. [PSI-ESS1-5](#)
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- PSI3-ETS1-1.** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. [PSI3-ETS1-1](#)
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## Energy

- PSI-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. [PSI-PS3-1](#)
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- PSI-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). [PSI-PS3-2](#)
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- PSI-PS3-3.** Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. [PSI-PS3-3](#)
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- PSI-PS3-4.** Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). [PSI-PS3-4](#)
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- PSI4-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. [PSI4-ETS1-3](#)
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## Waves

**PSI-PS4-1.** Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. [PSI-PS4-1](#)

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**PSI-PS4-2.** Evaluate questions about the advantages of using a digital transmission and storage of information. [PSI-PS4-2](#)

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**PSI-5-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. [PSI-5-ETS1-2](#)

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## Interactions of Humans and the Environment

**PSI-LS2-7.** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. [PSI-LS2-7](#)

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**PSI-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. [PSI-LS4-5](#)

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**PSI-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. [PSI-ESS2-1](#)

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**PSI-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. [PSI-ESS3-1](#)

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**PSI-ESS3-2.** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. [PSI-ESS3-2](#)

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**PSI6-ETS1-1.** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. [PSI6-ETS1-1](#)

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**PSI6-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. [PSI6-ETS1-2](#)

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**PSI6-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. [PSI6-ETS1-3](#)

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**PSI6-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. [PSI6-ETS1-4](#)