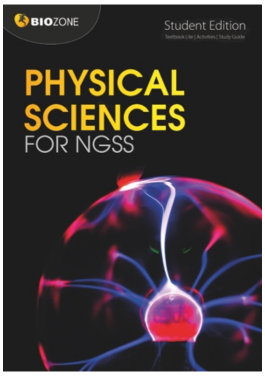

Alignment of BIOZONE's Physical Sciences for NGSS (1st edition) to Louisiana Student Standards for Physical Science

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Note 1: Correlation locations are activity numbers (not page numbers).

Note 2: Correlations do not usually include reference to the Science practices chapter

Note 3: Correlations include background material to address the specific standard

Louisiana: Student Standards for Physical Science

Standards source:
https://www.louisianabelieves.com/resources/library/academic-standards

TITLE: Physical Sciences for NGSS (1ed):

Correlation locations are activity numbers (not page numbers)**.**

Standard	Components	Correlation location
Matter and Its Interactions **HS.PS1.1** Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level and the composition of the nucleus of atoms.		24, 33
Science and Engineering Practices	**2. Developing and using models** Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.	19-24, 33, 82
	2. Developing and using models Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	19-24, 33, 82
Disciplinary Core Ideas	**Structure and properties of matter** Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (HS.PS1A.a)	19-22
	Structure and properties of matter The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.(HS.PS1A.b)	16, 23, 24
	Types of interactions Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.(HS.PS2B.c)	81, 82
Crosscutting Concepts	**Patterns** Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.	16, 19-24, 33, 81, 82

Matter and Its Interactions **HS.PS1.2** Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.		54, 55
Science and Engineering Practices	**6. Constructing explanations and designing solutions** Constructing explanations (science) and designing solutions (engineering) in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.	40, 41, 55
	6. Constructing explanations and designing solutions Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	40, 41, 55
Disciplinary Core Ideas	**Structure and properties of matter** The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (HS.PS1A.b)	16, 23, 24
	Chemical reactions The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS.PS1B.c)	40, 41, 54, 55
Crosscutting Concepts	**Patterns** Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.	16, 23, 24, 40, 41, 55

Matter and Its Interactions **HS.PS1.7** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.		55
Science and Engineering Practices	**5. Using mathematics and computational thinking** Using mathematics and computational thinking: Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions, including, computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions	40, 41, 55
	5. Using mathematics and computational thinking Use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to describe and/or support claims and/or explanations.	40, 41, 55
Disciplinary Core Ideas	**Chemical reactions** The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS.PS1B.c)	40, 41, 54, 55
Crosscutting Concepts	**Energy and matter** The total amount of energy and matter in closed systems is conserved.	40, 41, 55

Matter and Its Interactions **HS.PS1.8** Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.		60, 61, 63
Science and Engineering Practices	**2. Developing and using models** Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.	57-61
	2. Developing and using models Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	57-61
Disciplinary Core Ideas	**Nuclear processes** Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. (HS.PS1C.a)	57-61, 63
Crosscutting Concepts	**Energy and matter** In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.	57-61, 63

Motion and Stability: Forces and Interactions **HS.PS2.1** Analyze data to support the claim that Newton's second law of motion describes.		69, 77
Science and Engineering Practices	**4. Analyzing and interpreting data** Analyzing data in 9-12 builds on K-8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.	69, 77
	4. Analyzing and interpreting data Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.	69, 77
Disciplinary Core Ideas	**Forces and motion** Newton's second law accurately predicts changes in the motion of macroscopic objects. (HS.PS2.A.a)	69, 77
Crosscutting Concepts	**Cause and effect** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.	69, 77

Motion and Stability: Forces and Interactions **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.		73, 77
Science and Engineering Practices	**5. Using mathematics and computational thinking** Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions, including, computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.	71-73, 77
	5. Using mathematics and computational thinking Use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to describe and/or support claims and/or explanations.	71-73, 77
Disciplinary Core Ideas	**Forces and motion** Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. In any system, total momentum is always conserved. (HS.PS2A.b)	71
	Forces and motion If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (HS.PS2A.c)	72-73, 77
Crosscutting Concepts	**Systems and system models** When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.	71-73, 77

Motion and Stability: Forces and Interactions **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.		75
Science and Engineering Practices	**6. Constructing explanations and designing solutions** Constructing explanations (science) and designing solutions (engineering) in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.	75
	6. Constructing explanations and designing solutions Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.	75
Disciplinary Core Ideas	**Forces and motion** If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (HS.PS2A.c)	72-73, 77
	Defining and delimiting engineering problems Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS.ETS1A.a)	75
	Optimizing the design solution Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade- offs) may be needed. (HS.ETS1C.a)	75
Crosscutting Concepts	**Cause and effect** Systems can be designed to cause a desired effect.	72-73, 75, 77

Motion and Stability: Forces and Interactions **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.		86
Science and Engineering Practices	**3. Planning and carrying out investigations** Investigations: Planning and carrying out investigations to answer questions or test solutions to problems in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.	86
	3. Planning and carrying out investigations Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.	81, 84-86, 88
Disciplinary Core Ideas	**Types of interactions** Forces that act over a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (HS.PS2B.b)	78-88, 91
	Definitions of energy “Electrical energy” may mean energy stored in a battery or energy transmitted by electric currents. (HS.PS3A.d)	93
Crosscutting Concepts	**Cause and effect** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.	83-88

Energy **HS.PS3.2** Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles/objects and energy associated with the relative positions of particles/objects.		97
Science and Engineering Practices	**3. Planning and carrying out investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.	97
	3. Planning and carrying out investigations Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.	97
Disciplinary Core Ideas	**Definitions of energy** Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. There is a single quantity called energy. A system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (HS.PS3A.a)	97, 98, 103
	Definitions of energy At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (HS.PS3A.b)	93
	Definitions of energy These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (HS.PS3A.c)	105
Crosscutting Concepts	**Energy and matter** Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems.	93, 97, 98 103

Energy **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.		108
Science and Engineering Practices	**6. Constructing explanations and designing solutions** Constructing explanations (science) and designing solutions (engineering) in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.	88, 103, 108
	6. Constructing explanations and designing solutions Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.	108
Disciplinary Core Ideas	**Definitions of energy** At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (HS.PS3A.b)	93
	Energy in chemical processes Although energy cannot be destroyed, it can be converted to other forms—for example, to thermal energy in the surrounding environment. (HS.PS3D.a)	88, 97, 103, 107, 108
	Defining and delimiting engineering problems Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS.ETS1A.a)	N/A
Crosscutting Concepts	**Energy and matter** Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.	88, 93, 97, 103, 107, 108

Energy **HS.PS3.4** Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).		104, 105
Science and Engineering Practices	**3. Planning and carrying out investigations** Planning and carrying out investigations to answer questions (science) or test solutions to problems (engineering) in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.	104, 105
	3. Planning and carrying out investigations Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.	104, 105
Disciplinary Core Ideas	**Conservation of energy and energy transfer** Energy cannot be created or destroyed, but it can be transported from one place to another, transformed into other forms, and transferred between systems. (HS.PS3B.b)	103
	Conservation of energy and energy transfer Uncontrolled systems always evolve toward more stable states--that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (HS.PS3B.e)	104, 107, 110
	Energy in chemical processes and everyday life Although energy cannot be destroyed, it can be converted to less useful other forms—for example, to thermal energy in the surrounding environment. (HS.PS3D.a)	46, 47, 48, 52, 55,105
Crosscutting Concepts	**System and system models** When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.	103-105, 107, 110

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.		84, 87
Science and Engineering Practices	**2. Developing and using models** Modeling in 9-12 builds on K-8 experiences and progresses to using synthesizing and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).	84, 87
	2. Developing and using models Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	83-85, 87
Disciplinary Core Ideas	**Relationships between energy and forces** When two objects interacting through a field change relative position, the energy stored in the field is changed. (HS.PS3C.a)	83-87
Crosscutting Concepts	**Cause and effect** Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.	83-87

Waves and their Applications **HS.PS4.1** Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.		120
Science and Engineering Practices	**2. Developing and using models** Modeling in 9-12 builds on K-8 experiences and progresses to using synthesizing and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).	112, 113, 120
	2. Developing and using models Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.	112, 113, 120
Disciplinary Core Ideas	**Wave properties** The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. (HS.PS4A.a)	112, 113, 115-118
Crosscutting Concepts	**Cause and effect** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.	112, 113, 115-118

Waves and their Applications **HS.PS4.4** Evaluate the validity and reliability of claims in published materials regarding the effects that different frequencies of electromagnetic radiation have when absorbed by matter.		124
Science and Engineering Practices	**8. Obtaining, evaluating, and communicating information** Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.	124
	8. Obtaining, evaluating, and communicating information Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible.	124
Disciplinary Core Ideas	**Electromagnetic radiation** When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells. (HS.PS4B.b)	122-125, 127
Crosscutting Concepts	**Cause and effect** Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.	N/A