

Content: Physical Science	Grade or Course: 8th	Date Developed: 8/10/18
<p>Overview:</p> <p>In 8th grade Physical Science students' will develop an understanding of five core ideas: matter and its interactions, chemical reactions, energy, waves, and forces & motion. With each unit of study students will engage in projects that require them to incorporate NGSS scientific and engineering practices to help solve real-world problems. Throughout the year students will immerse themselves in two integrative projects that will focus on creativity, collaboration, communication and critical thinking.</p> <p>Unit 1: <u>Matter and its Interactions</u> students will learn how matter is composed of atoms and molecules and will be able to explain the properties of various substances. Students will demonstrate their understanding through the development of models to describe the atomic composition of simple molecules and extended structures.</p> <p>Unit 2: <u>Chemical Reactions</u> students will learn how new molecules are formed from the reactions between various substances. Students will demonstrate their understanding by analyzing and interpreting data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. These two units will provide students with the foundation to begin our interdisciplinary project on water.....</p> <p>Unit 3: <u>Energy</u> students will learn that kinetic energy can be distinguished from the various forms of potential energy. Energy changes to and from each type can be tracked through physical or chemical interactions. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter. Students will demonstrate their understanding by applying scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer through their penguin shelter project.</p> <p>Unit 4: <u>Waves and Radiation</u> students will learn how a simple wave model has a repeating pattern with a specific wavelength, frequency, and amplitude, and mechanical waves need a medium through which they are transmitted. Students will demonstrate their understanding by developing a public service announcement on a form of radiation that uses 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 and describes how waves are reflected, absorbed, or transmitted through various materials.</p> <p>Unit 5: <u>Forces and Motion</u> students will learn how the mass of an object must be qualitatively accounted for in any change of motion due to the application of a force and When two objects interact, each one exerts a force on the other, and these forces can transfer energy between them. Students will demonstrate their understanding through the interdisciplinary project sculpture races.....</p>		

Essential Questions:

How do particles combine to form the variety of matter one observes?

How do substances combine or change (react) to make new substances? How does one characterize and explain these reactions and make predictions about them?

Why are some physical systems more stable than others?

What is energy?

What is meant by conservation of energy? How is energy transferred between objects or systems?

How do food and fuel provide energy? If energy is conserved, why do people say it is produced or used?

What are the characteristic properties and behaviors of waves?

What is light? How can one explain the varied effects that involve light? What other forms of electromagnetic radiation are there?

How are instruments that transmit and detect waves used to expand human senses?

How are forces related to energy?

How can one predict an object's continued motion, change in motion, or stability?

What underlying forces explain the variety of interactions observed?

EO's addressed to proficiency level:

I can explain why matter is classified as an element, molecule, compound, mixture or solution. (Constructing Support)

I can differentiate between physical and chemical changes and categorize mixtures as homogeneous solutions or heterogeneous mixtures (Comparing and Classifying)

I can distinguish the three types of heat transfer within one system and explain how they interact. (Abstracting)

I can create an argument for how dangerous a wave can be based on its intensity and comparison of other waves.

I can design a solution to a problem based on Newton's Laws.

Content Standards:

STRUCTURE AND PROPERTIES OF

MATTER- The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter. (PS1.A)

CHEMICAL REACTIONS- Reacting substances rearrange to form different molecules, but the number of atoms is conserved. Some reactions release energy and others absorb energy.(PS1.B)

FORCES AND MOTION- The role of the mass of an object must be qualitatively accounted for in any change of motion due to the application of a force. (PS2.A)

TYPES OF INTERACTIONS- Forces that act at a distance involve fields that can be mapped by their relative strength and effect on an object. (PS2.B)

ENERGY- Kinetic energy can be distinguished from the various forms of potential energy. Energy changes to and from each type can be tracked through physical or chemical interactions. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter. (PS3.A PS3.B)

RELATIONSHIP BETWEEN ENERGY AND FORCES- When two objects interact, each one exerts a force on the other, and these

Performance Standards:

STRUCTURE AND PROPERTIES OF MATTER

Develop models to describe the atomic composition of simple molecules and extended structures

Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. [MS-PS1-3](#)

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. [MS-PS1-4](#)

CHEMICAL REACTIONS

Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. [MS-PS1-2](#)

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.[MS-PS1-5](#)

Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. [MS-PS1-6](#)

FORCES AND MOTION

Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. [MS-PS2-1](#)

forces can transfer energy between them. (PS3.C)

ENERGY IN CHEMICAL PROCESSES AND EVERYDAY LIFE- Sunlight is captured by plants and used in a reaction to produce sugar molecules, which can be reversed by burning those molecules to release energy. (PS3.D)

WAVE PROPERTIES- A simple wave model has a repeating pattern with a specific wavelength, frequency, and amplitude, and mechanical waves need a medium through which they are transmitted. This model can explain many phenomena including sound and light. Waves can transmit energy. (PS4.A)

ELECTROMAGNETIC RADIATION- The construct of a wave is used to model how light interacts with objects. (PS.B)

INFORMATION TECHNOLOGIES AND INSTRUMENTATION- Waves can be used to transmit digital information. Digitized information is comprised of a pattern of 1s and 0s. (PS4.C)

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. [MS-PS2-2](#)

Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. [MS-PS2-3](#)

Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. [MS-PS2-4](#)

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. [MS-PS2-5](#)

ENERGY

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. [MS-PS3-1](#)

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. [MS-PS3-2](#)

Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. [MS-PS3-3](#)

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. [MS-PS3-4](#)

Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. [MS-PS3-5](#)

WAVES AND ELECTROMAGNETIC RADIATION

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. [MS-PS4-1](#)

Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [MS-PS4-2](#)

Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. [MS-PS4-3](#)

Units:

1. Structures and Properties of Matter (8 weeks)
2. Chemical Reactions (4 weeks)
3. Energy (4 weeks)
4. Waves and Radiation (8 weeks)
5. Forces and Motion (8 weeks)

Assessments:

1. Structures and Properties of Matter
 - a. Alien Periodic Table Summative
 - b. Gum Drop Atomic Models
2. Chemical Reactions
 - a. Chemical Reaction CER Summative
 - b. Water Project
3. Energy
 - a. Heat Transfer Summative
 - b. Penguin Project
4. Waves and Radiation
 - a. Tsunami Energy Summative
 - b. Skin Cancer Digital Poster/ Radiation Student-Led Lesson
5. Forces and Motion
 - a. Create a Collision Summative
 - b. Sculpture Race

