Curriculum Map: Science 8 2019

Course: SCIENCE 8 Sub-topic: General

Grade(s): 8

Course Description:	8th grade physical science: This course is an introduction to Chemistry and Physics applications. Physical Science is a branch of natural science that studies non-living systems, in contrast to the life sciences. Including some of the life sciences (organic chemistry, for example).
Course Textbooks, Workbooks, Materials Citations:	Physical Science McGraw Hill 2017
Vocabulary:	See individual Units for a comprehensive list of vocabulary terms
Course Interdisciplinary Connections:	Physical Sciences involve the continuation of skills learned in Earth Space & Life Sciences. Math skills- use of SI as well as algebraic formulas, and graphing. Writing and reading skills are incorporated in Lab report writing as well as Art for illustrating the results of the lab. Sound dynamics incorporates Music.
Course Notes:	Current curriculum includes Standards from SAS & NGSS. NGSS will be forthcoming in 2022 for the district

Unit: Unit 1. Nature of Science

Timeline: August to October

Month:	1st month & 1/2 of school
Skills:	Demonstrate an understanding of basic science techniques, such as the Scientific Method (scientific Inquiry) and measurement. Develop & complete an experiment identifying each variable.
Essential Questions:	How is Scientific Inquiry used in real life situations? (unit EQ) What is Scientific Inquiry? How do you formulate a Hypothesis? How does bias effect scientific experiments? What do SI prefixes mean? Why do scientists record in journals?
Content:	(E) Scientific Inquiry Observation Inference Prediction Design/implement an experiment Data Collection, Measuring Analysis of Data Conclusion

Publish

Assessments: unit test: McGraw Hill

Lab participation & reports

Notebook/journals

vocabulary quizzes

Homework

Class participation

Lessons: Scientific Problem Solving emphasize all

Lesson 1: Scientific Inquiry

Lesson 2: Measurement and Scientific Tools

Lesson 3: Case Study (minimize)

Safety in the Lab Emphasize safety rules

Vocabulary: (E) Observation:

(E) Hypothesis:

(E) Prediction:

(E) Inference:

(E) Data:

(I) Bias:

(E) Qualitative:

(E) Quantitative:

(E) Scientific Law:

(E) Scientific Theory:

(E) SI:

(E) PREFIXES

(E) Mass:

(E) Volume:

(C) Derived Units:

(C) Percent Error:

(E) Peer Review

(E) Independent Variable:

(E) Dependent Variable:

(I) Technology:

(E) Critical Thinking:

Resources: McGraw Hill connected unit resources

materials for labs (yarn, sponge animals, graduated cylinders, Triple beam Balances, straws, cotton string, cardboard- for bridge design)

STANDARDS:

STANDARDS

NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)	
1-LS1 (Advanced)	From Molecules to Organisms: Structures and Processes
STATE: Pennsylvania State Anchors (2010)	
S8.A.1 (Advanced)	Reasoning and Analysis
S8.A.1 1 (Advanced)	Explain, interpret, and apply scientific, environmental, or technological knowledge presented in a variety of formats (e.g., visuals, scenarios, graphs).
S8.A.1.1.1 (Advanced)	Distinguish between a scientific theory and an opinion, explaining how a theory is supported with evidence, or how new data/information may change existing theories and practices.
S8.A.1.1.2 (Advanced)	Explain how certain questions can be answered through scientific inquiry and/or technological design.
S8.A.1.1.4 (Advanced)	Develop descriptions, explanations, predictions, and models using evidence.
S8.A.1.3.1 (Advanced)	Use ratio to describe change (e.g., percents, parts per million, grams per cubic centimeter, mechanical advantage).
S8.A.2 (Advanced)	Processes, Procedures, and Tools of Scientific Investigations
S8.A.2.1 (Advanced)	Apply knowledge of scientific investigation or technological design in different contexts to make inferences to solve problems.
S8.A.2.1.1 (Advanced)	Use evidence, observations, or a variety of scales (e.g., mass, distance, volume, temperature) to describe relationships.
S8.A.2.1.6 (Advanced)	Identify a design flaw in a simple technological system and devise possible working solutions.
NGSS Arranged by Disciplinary Core Idea (DCI) - Science (2013)	
1-PS4-1 (Advanced)	Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
1-PS4-2 (Advanced)	Make observations to construct an evidence-based account that objects can be seen only when illuminated.
1-PS4-4 (Advanced)	Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

Topic: Scientific Method

Core Lesson Description: Students will begin the year reviewing the concepts of the Scientific Method. Beginning with Observations and questions about the observations, students will identify a "question" that they wish answered and develop a way of testing the question. They will identify the parts of an experiment (dependent variable, independent variable, control group, experimental group) and collect data. They will learn to graph the data (as appropriate) and write a lab report to say what was done in the experiment, why, the conclusion of the experiment and what changes could be made for future experiments.

Core Lesson How do I write a lab report

Student Learning Objectives: What is involved in creating a lab

Core Lesson Essential Questions:
What is the 1st step of the scientific method?

What is a dependent variable?

What is an independent variable?

How do I construct a graph?

What equipment is best for this experiment?

Core Lesson Big Ideas:
How to write a lab report

What an independent variable is and what a dependent variable is.

Core Lesson Materials:
notes

various labs

Core Lesson Key Terminology & Definitions:
observation

hypothesis

dependent variable

independent variable

data

Topic: SI units

Core Lesson Description:
students will learn the prefixes for the International System of Measurement (SI).

students will practice converting standard measurement to SI and vice versa.

Scientific notation will be introduced

Emphasis on use of the SI system by scientists will be made because of the consistency of measurement

Core Lesson Student Learning Objectives:
students will learn the prefixes for the International System of Measurement (SI).

students will practice converting standard measurement to SI and vice versa.

Scientific notation will be introduced

Emphasis on use of the SI system by scientists will be made because of the consistency of measurement

Core Lesson Big
SI is used internationally due to it's consistency. Scientists use the SI system to be able to communicate with

Ideas: other scientists

Core Lesson Materials: measuring labs,

triple beam balances or electronic scales

weights

meter sticks

Core Lesson Key Terminology & Definitions: meter

liter

gram

second

prefixes (micro, milli, deci, centi, Deka, Hecta, Kilo)

Topic: Safety & Lab equipment

Core Lesson Description: Safety in the lab is essential for science students. Shortcuts taken to quickly do the lab can lead to injury. Students are introduced to the lab equipment, proper use of that equipment and general safety techniques. They are also asked to identify where the differing equipment is and what to do in the case of an emergency.

Core Lesson Student Learning Objectives: Students will use the most efficient lab materials in a safe manner

Core Lesson Essential Questions: What do I use for measuring length?

What is mass

What is the difference between mass & weight?

Where are the emergency exits?

Core Lesson Big Ideas: What equipment is used for what process, where are the emergency exits, emergency equipment

Core Lesson Materials: measuring labs

worksheets for practice

notes

Unit: Unit 2. Basics of Chemistry/Matter

Timeline: October to December

Skills: The atoms in all objects are not the same.

You cannot always tell by an object's appearance whether it is made of more than one type of atom.

The mass of a material never changes, regardless of where it is, b ut weight will change with the pull of gravity

Boiling is one method used to separate parts of a mixture

Heating a material increases the energy of its particles

When you stir sugar into water, the sugar and water evenly mix

When wood burns, new materials form

Temperature can affect the rate at which chemical changes occur

Essential Questions:

What is matter and how does it change?

What are some physical properties of matter?

How can a change in energy affect the state of matter?

What is a chemical property?

What are solutions, & how are they described?

Why do some substances dissolve in water & others do not?

What happens when acids & bases dissolve in water?

What physical changes and energy changes occur as matter goes from one state to another?
How is temperature related to particle motion?

How do force and area affect pressure?

What factors affect the density of an object?

Content:

(E) Foundations of Chemistry

introduction to the atoms, subatomic particles and charges

(C) Mixtures, Solubility, & Acids/Base Solutions

Solutions, pH scale, and characteristics of each

(I) Chemical Reactions and Equations

How elements combine and how to read chemical reactions and equations

(E) States of Matter

Solids, Liquids, Gases and properties of each

(C) Forces and Fluids

Buoyancy, density, mass & weight are investigated as well as gas laws

Assessments: standardized tests, labs, quizzes

Lessons: Chapter 7: Foundations of Chemistry- (Emphasize all lessons)

Lesson 1: Classifying Matter

Lesson 2: Physical Properties

Lesson 3: Physical Changes

Lesson 4: Chemical Properties and Changes

Chapter 13: Mixtures, Solubility, and Acid/Base Solutions (Minimize/brief overview)

Lesson 1: Substances & Mixtures

Lesson 2: Properties of Solutions

Lesson 3: Acid & Base Solutions

Chapter 12: Chemical Reactions and Equations (Lesson 1 done in conjunction with Chapter 7, Lessons 2 & 3 are minimized)

Lesson 1: Understanding Chemical Reactions

Lesson 2: Types of Chemical Reactions

Lesson 3: Energy Changes and Chemical Reactions

Chapter 8: States of Matter

Lesson 1: Solids, Liquids, & Gases Emphasize

Lesson 2: Changes in State (reinforces Chapter 7)

Lesson 3: The Behavior of Gases (minimize)

Chapter 4: Forces and Fluids

Lesson 1: Pressure and Density of Fluids: Emphasize (reinforces density learned in Chapter 7)

Lesson 2: The Buoyant Force (minimize)

Lesson 3: Other Effects of Fluid Forces (minimize)

Vocabulary:

(E) atom: a small particle that is the building block of matter

(E) compound: a type of substance that is made up of tow or more different elements chemically bonded together

(I) dissolve: to form a solution by mixing evenly

(E) element: a substance that consists of only one type of atom

(I) heterogeneous mixture: a type of mixture where the individual substances are not evenly mixed

(I) homogeneous mixture: a type of mixture where the individual substances are evenly mixed

(E) matter: anything that has mass & takes up space

(E) mixture: matter that can vary in composition

(C) substance: matter with a composition that is always the same

(E) density: the mass per unit volume of of a substance

(E) mass: the amount of matter in an object

(E) physical property: a characteristic of matter that you can observe or measure without changing the identity of the matter

(I) solubility: the ability of one substance to dissolve in another

(I) physical change: a change in size, shape, form or state of matter in which the matter's identity stays the same

(I) chemical change: a change in matter in which the substances that make up the matter

change into other substances with new physical and chemical properties

(C) chemical property: a characteristic of matter that can be observed as it changes to a different type of matter

(I) concentration: the amount of substance in a certain volume

Resources: Mcgraw Hill Physical Science book, ConncectEd website for Physical science

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

MS-PS1-2 (Advanced)	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
MS-PS1-5 (Advanced)	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-PS1-6 (Advanced)	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
MS-PS1-3 (Advanced)	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
MS-PS1-4 (Advanced)	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.

Topic: Classifying Matter

Minutes for Topic: 42

Core Lesson Description: Describing that like living things, nonliving things are made of smaller units. In living things, we call these cell. In non living things, these particles are called atoms

Core Lesson Student Learning Objectives: By the end of this lesson students should be able to identify the parts of an atom.

By the end of this lesson, students should be able to tell the difference between mixtures and compounds.

Core Lesson Essential Questions: What is a substance?

How do atoms of different elements differ?

How can you classify matter?

Core Lesson Big Ideas: What are the parts of an atom?

How does the periodic table of elements tell you about the different parts of an atom?

What is the difference between a homogeneous and heterogeneous mixture?

Core Lesson Key Terminology & Definitions: (E) atom: a small particle that is the building block of matter

(E) compound: a type of substance that is made up of tow or more different elements chemically bonded together

(I) dissolve: to form a solution by mixing evenly

(E) element: a substance that consists of only one type of atom

(C) heterogeneous mixture: a type of mixture where the individual substances are not evenly mixed

(C) homogeneous mixture: a type of mixture where the individual substances are evenly mixed

(E) matter: anything that has mass & takes up space

(E) mixture: matter that can vary in composition

(I) substance: matter with a composition that is always the same

STANDARDS

NGSS Arranged by Topic - Science (2013)

MS-PS1-2 (Advanced)	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
MS-PS1-5 (Advanced)	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-PS1-6 (Advanced)	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

Topic: Physical Properties

Minutes for Topic: 42

Core Lesson Description: Description of physical properties of matter and how these physical properties can be used to separate mixtures

Core Lesson Student Learning Objectives: By the end of this lesson students should be able to identify the physical properties of matter.

Core Lesson Essential Questions: What are some of the physical properties of matter?

How are physical properties used to separate mixtures?

Core Lesson Big Ideas: Physical properties are those that define an object (metal, malleability, hardness, color, shape, size, texture)

characteristic & quality are often synonymous with property

Core Lesson Key Terminology & Definitions:

(E) density: the mass per unit volume of of a substance

(E) mass: the amount of matter in an object

(I) physical property: a characteristic of matter that you can observe or measure without changing the identity of the matter

(I) solubility: the ability of one substance to dissolve in another

STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.C.1 (Advanced)	Structure, Properties, and Interaction of Matter and Energy
S8.C.1.1 (Advanced)	Explain concepts about the structure and properties (physical and chemical) of matter.
S8.C.1.1.1 (Advanced)	Explain the differences among elements, compounds, and mixtures.
S8.C.1.1.2 (Advanced)	Use characteristic physical or chemical properties to distinguish one substance from another (e.g., density, thermal expansion/contraction, freezing/melting points, streak test).

Topic: Physical Changes

Minutes for Topic: 42

Core Lesson Description:

Describing that physical changes do NOT change the energy of an object.

Describe the conservation of mass

Core Lesson Student Learning Objectives:

By the end of the lesson students will be able to identify words synonymous with physical (tangible, material, concrete, real, visible).

By the end of this lesson students will be able to answer words synonymous with change (adjustment, modification, conversion, metamorphosis, transformation)

Core Lesson Essential Questions:

How can a change in the energy affect the state of matter?

What happens when something dissolves?

What is meant by conservation of mass?

Core Lesson Big Ideas:

How does adding or removing thermal energy change the energy of the object?

What physical property identifies the temperature at which the attraction between particles in a substance becomes less, which allows particles to slide past each other?

Core Lesson Key Terminology & Definitions:

physical change: a change in size, shape, form or state of matter in which the matter's identity stays the same

STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.C.1 (Advanced)	Structure, Properties, and Interaction of Matter and Energy
S8.C.1.1 (Advanced)	Explain concepts about the structure and properties (physical and chemical) of matter.
S8.C.1.1.1 (Advanced)	Explain the differences among elements, compounds, and mixtures.
S8.C.1.1.2 (Advanced)	Use characteristic physical or chemical properties to distinguish one substance from another (e.g., density, thermal expansion/contraction, freezing/melting points, streak test).
S8.C.1.1.3 (Advanced)	Identify and describe reactants and products of simple chemical reactions.
S8.C.2 (Advanced)	Forms, Sources, Conversion, and Transfer of Energy
S8.C.2.1 (Advanced)	Describe energy sources, transfer of energy, or conversion of energy.

Topic: Chemical properties and changes

Minutes for Topic: 42

Core Lesson Description:

Explaining chemical changes and signs to look for to denote a change taking place.

How to read and balance chemical equations

What affects the speed of chemical reactions

Core Lesson Student Learning Objectives: By the end of this lessons, students should be able to discuss the difference between properties of matter and changes in matter.

Core Lesson Essential Questions:

What is a chemical property?

What are some signs of chemical change?

Why are chemical equations useful?

What are some factors that affect the rate of chemical reactions?

Core Lesson Big Ideas: How to connect chemistry to the real world

Core Lesson Key Terminology & Definitions:

chemical change: a change in matter in which the substances that make up the matter change into other substances with new physical and chemical properties

chemical property: a characteristic of matter that can be observed as it changes to a different type of matter

concentration: the amount of substance in a certain volume

STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.C.1 (Advanced)	Structure, Properties, and Interaction of Matter and Energy
S8.C.1.1 (Advanced)	Explain concepts about the structure and properties (physical and chemical) of matter.
S8.C.1.1.1 (Advanced)	Explain the differences among elements, compounds, and mixtures.
S8.C.1.1.2 (Advanced)	Use characteristic physical or chemical properties to distinguish one substance from another (e.g., density, thermal expansion/contraction, freezing/melting points, streak test).
S8.C.1.1.3 (Advanced)	Identify and describe reactants and products of simple chemical reactions.
S8.C.2 (Advanced)	Forms, Sources, Conversion, and Transfer of Energy
S8.C.2.1 (Advanced)	Describe energy sources, transfer of energy, or conversion of energy.

Topic: States of Matter

Minutes for Topic: 42

Core Lesson Description: gives an overview of the atomic structure of solids, liquids & gasses and how they interact with the addition and removal of thermal energy

Core Lesson Student Learning Objectives: Students will be able to identify the 3 main states of matter (as well as Plasma) and how the atoms/molecules interact within these matters.

Students will be able to identify what happens when thermal energy is added or removed from a substance

Core Lesson Essential Questions:

How do particles move in solids, liquids, and gases?

How are the forces between particles different in solids, liquids, and gases?

How are temperature and thermal energy different?

What happens to thermal energy when matter changes from one state to another?

How do pressure changes affect the volume of a gas?

Core Lesson Key Terminology & Definitions:

Lesson 1

gas: matter that has no definite volume and no definite shape

liquid: matter with a definite volume but no definite shape

matter: anything that takes up space and has mass

solid: matter that has a definite volume and a definite shape

surface tension: uneven forces acting on the particles on the surface of a liquid

vapor: gas state of a substance that is normally a solid or a liquid at room temperature

viscosity: measurement of a liquid's resistance to flow

Lesson 2

condensation: change of state from a gas to a liquid

deposition: change of state of a gas to a solid without going through the liquid state

evaporation: vaporization that occurs only at the surface of a liquid

kinetic energy: kind of energy that an object has due to its motion

sublimation: change of state of a solid to a gas without going through the liquid state

temperature: measure of the average kinetic energy of all the particles in an object

thermal energy: total potential and kinetic energies of an object

vaporization: change of state of a liquid into a gas

Lesson 3

Boyle's law: states that pressure of a gas increases if the volume decreases and pressure of a gas decreases if volume increases, when temperature is constant

Charles's law: states that the volume of a gas increases with increasing temperature, if pressure is constant
kinetic molecular theory an explanation of how particles in matter behave

pressure: amount of force applied per unit of area

STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.C.1 (Advanced)	Structure, Properties, and Interaction of Matter and Energy
S8.C.1.1 (Advanced)	Explain concepts about the structure and properties (physical and chemical) of matter.
S8.C.1.1.1 (Advanced)	Explain the differences among elements, compounds, and mixtures.
S8.C.1.1.2 (Advanced)	Use characteristic physical or chemical properties to distinguish one substance from another (e.g., density, thermal expansion/contraction, freezing/melting points, streak test).
S8.C.1.1.3 (Advanced)	Identify and describe reactants and products of simple chemical reactions.
S8.C.2.1 (Advanced)	Describe energy sources, transfer of energy, or conversion of energy.
S8.C.2.1.1 (Advanced)	Distinguish among forms of energy (e.g., electrical, mechanical, chemical, light, sound, nuclear) and sources of energy (i.e., renewable and nonrenewable energy)
S8.C.2.1.2 (Advanced)	Explain how energy is transferred from one place to another through convection, conduction, or radiation.

S8.C.2.1.3 (Advanced) Describe how one form of energy (e.g., electrical, mechanical, chemical, light, sound, nuclear) can be converted into a different form of energy.

Topic:

Unit: Unit 3. Chemistry and the Periodic Table
Timeline: December to February

Skills:

An atom is the smallest unit of an element and is made mostly of empty space. It contains a tiny nucleus surrounded by an electron cloud.

Lesson 1: Discovering Parts of an Atom

Lesson 2: Protons, Neutrons, and Electrons — How Atoms Differ

Lesson 1: Using the Periodic Table (how elements are organized)

Lessons 2 & 3: Metals & Non Metals: physical characteristics of elements

Lesson 1: How do elements join together to form chemical compounds (valence electrons, covalent & ionic bonds, polar molecules)

Lesson 1: Why is Carbon essential to life? (biochemistry introduction)

Essential Questions:

What are atoms?

What are the parts of an atom?

What is the Periodic Table?

What are Valence Electrons?

Why do compounds form?

What is Carbon Chemistry?

Content:

(E) Understanding the Atom

valence shells, neutrality, charged particles

(C) The Periodic Table

set-up of periodic table and nature of elements.

(E) Elements & Chemical Bonds

covalent bonds (shared electrons, ionic bonds, hydrogen bonds

(I) Carbon Chemistry

Introduced in this chapter. Carbon chemistry is explored ore in the spring and in 9th grade biology. Combines the chemical reactions that happen in and are important to life.

Assessments: combined chapter tests, element project: utilizes technology and research techniques

Lessons:

Chapter 9 (Understanding the Atom:

Lesson 1- Discovering parts of the atom: Parts of the Atom is emphasized. Discoveries and experiments are given minimal emphasis.

Lesson 2: Protons, Neutrons, and Electrons- minimized as it has been gone over in other lessons.

Chapter 10: (The Periodic Table).

Lesson 1: Using the Periodic Table- emphasized.

Lessons 2: Metals: minimized

Lesson 3: Nonmetals & Metalloids: minimized

Chapter 11: (Elements & Chemical Bonds).

Lesson 1: Electrons and Energy Levels reinforces information learned in Chapter 7. Emphasis is on Valence Electrons.

Lesson 2: Compounds, Chemical Formulas, and Covalent Bonds: Reinforcement of Chapter 12. The emphasis should be why compounds form.

Lesson 3: Ionic and Metallic Bonds: Minimize

Chapter 14 (Carbon Chemistry).

Lesson 1: Elemental Carbon and Simple Organic Compounds. Empathize Carbon's necessity for life & life processes.

Lesson 2: Other Organic Compounds: minimize (will be reinforced in 9th grade)

Lesson 3: Compounds of Life: Empathize Carbon's unique ability to bond in a variety of ways (hydrocarbons, carbohydrates, proteins, nucleic acids, enzymes, amino acids) this will be expanded on in 9th grade biology

Vocabulary: Lesson 1

(E) atom: smallest piece of an element that still represents the element

(E) electron: atomic particle with one negative charge (1–)

(I) electron cloud: area around an atomic nucleus where an electron is most likely to be found

(E) neutron: neutral particle in the nucleus of an atom

(E) nucleus: small area in the center of an atom in which most of an atom’s mass and positive charge is concentrated

(E) proton: atomic particle with one positive charge (1+)

Lesson 2

(E) atomic number: the number of protons in an atom of an element average

(I) atomic mass: average mass of an element’s isotopes, weighted according to the abundance of each isotope

(I) ion: atom that is no longer neutral because it has gained or lost electrons isotope any of two or more atoms of the same element that have different numbers of neutrons

(E) mass number: sum of the number of protons and neutrons in an atom

(I) nuclear decay: process that occurs when an unstable atomic nucleus changes into another more stable nucleus by emitting radiation

(I) radioactive: describes elements that spontaneously emit radiation spontaneous occurring without external force or cause

Periodic Table:

Lesson 1

(E) group: column on the periodic table

(E) period: row on the periodic table

(E) periodic table: chart of the elements arranged in rows and columns according to the elements' physical and chemical properties

Lesson 2

(I) alkali metal: element in group 1 on the periodic table

(I) alkaline earth metal: element in group 2 on the periodic table

(E) density: mass per unit volume of a substance

(I) ductility: ability of a substance to be pulled into thin wires

(I) luster: ability of a metal to reflect light

(I) malleability: ability of a substance to be hammered or rolled into sheets

(E) metal: generally shiny element; easily pulled into wires or hammered into thin sheets; a good conductor of electricity and thermal energy

(E) transition element: element in groups 3–12 on the periodic table

Lesson 3

(C) construct: to make by combining and arranging parts

(E) halogen: element in group 17 on the periodic table

(E) metalloid: element with physical and chemical properties of metals and nonmetals

(E) noble gas: element in group 18 on the periodic table

(I) nonmetal: element that has no metallic properties

(I) semiconductor: material that conducts electricity at high temperatures but not at low temperatures

Resources: McGraw Hill Physical Science Book

ConnectEd website

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

MS-PS1-2 (Advanced)	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
MS-PS1-5 (Advanced)	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-PS1-6 (Advanced)	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

STATE: Pennsylvania State Anchors (2010)

S8.C.1 (Advanced)	Structure, Properties, and Interaction of Matter and Energy
S8.C.1.1.3 (Advanced)	Identify and describe reactants and products of simple chemical reactions.

Topic: Understanding the Atom

Core Lesson Description: Students will be introduced to the Periodic Table of elements. Including the method of organization of the elements into groups and periods. Table keys emphasize the average atomic mass, atomic number, state of matter at room temperature.

Students will also be taught why elements combine together to create compounds. They will learn how to count atoms and balance equations. Types of bonds created will be presented and discussed

Core Lesson Student Learning Objectives: Students will be able to identify the parts of an atom and relate the subatomic charges to the composition of the model of the atom. Additionally, they should be able to predict which atoms would be inert, highly reactive, more likely to form ions,...

Core Lesson Big Ideas: How do compounds form

How do isotopes differ from stable elements

How do bonds form

Core Lesson Materials: McGraw Hill Physical Science text book

Atomic model kits

Core Lesson Key Terminology & Definitions: Bohr's model

electron

proton

neutron

Cation

Anion

Isotope

Ion

Molecule

Topic: The Periodic Table

Topic: Elements Symbols

Core Lesson Description: (I) This lesson is to introduce students to the process through which molecules and compounds are formed and how this can be predicted by the periodic table.

(I) Students will be introduced to ions and isotopes.

(E) It also introduces some simple bond concepts

Core Lesson Essential Questions:

What is an ion?

Why do elements create bonds?

What is an ionic bond?

What is a covalent bond?

What is a valence shell?

Core Lesson Materials:

worksheets,

notes,

periodic key project

balancing equation practice sheet

Core Lesson Key Terminology & Definitions:

(E) chemical bond force that holds atoms together

(E) compound material that is made up of two or more different kinds of atoms joined by chemical bonds

(E) electron dot diagram (AKA Bohr's model) model that represents valence electrons in an atom as dots around the element's chemical symbol

(E) valence electron outermost electron of an atom and participates in chemical bonding

(C) bond force that holds atoms together in a compound

(I) chemical formula group of chemical symbols and numbers that represent elements and numbers of atoms of each element that make up a compound

(E) covalent bond forms when two atoms share one or more pairs of valence electrons

(E) molecule group of atoms held together by covalent bonding

(I) polar molecule has a slight positive end and a slight negative end because of unequal sharing of electrons

(E) conduct to serve as a medium through which something can flow

(E) ion atom that is no longer electrically neutral because it has lost or gained valence electrons

(**E) isotope** same chemical formula compounds with different shapes

(E) ionic bond attraction between positively and negatively charged ions

(C) metallic bond forms when many metal atoms share their pooled valence electrons

Topic: Chemical Bonds and Equations

Core Lesson Description: students will learn how to determine the number of atoms in a compound (atom count). They will practice counting atoms in compounds and attempting to balance simple equations maintaining the number of atoms (conservation of matter)

Core Lesson Student Learning (E) knowledge of how many atoms are in a compound and how those atoms may recombine, but the number remains the same.

Objectives:

(C) They will also be able to identify the reactants and the products

(I) learning how to read the chemical equation (6CO2 = 6 molecules of Carbon Dioxide)

Core Lesson Essential Questions:

How many molecules are in a compound?

What are Reactants?

What are Products?

What is the law of conservation of matter and energy?

Core Lesson Big Ideas:

The law of conservation of matter does not allow for matter or energy to be "lost", only transformed into another form

Core Lesson Materials:

notes,

worksheets for practice

content quizzes & tests

Core Lesson Key Terminology & Definitions:

(E) chemical bond attraction between atoms when electrons are shared, transferred, or pooled

(E) chemical equation description of a reaction using element symbols and chemical formulas

(E) chemical reaction process in which atoms of one or more substances rearrange to form one or more new substances

(E) coefficient number placed in front of an element symbol or chemical formula in an equation

(E) law of conservation of mass states that the total mass of the reactants before a chemical reaction is the same as the total mass of the products after the chemical reaction

(I) product new substance produced by a chemical reaction

(I) reactant starting substance in a chemical reaction

(C) combustion chemical reaction in which a substance combines with oxygen and releases energy

(E) decomposition chemical reaction in which one compound breaks down and forms two or more substances

Topic: Atomic Mass, Atomic Weight, Atomic number

Core Lesson Description:

in this lesson, students will become familiar with the atomic number (# of protons) and the average atomic mass (average number of protons & neutrons of all isotopes - as found on the periodic table). Since this lesson is a review of information from the periodic table chapter as well as the parts of the atom chapter, it should be treated as a review or able to provide some more in depth student research into the use of chemicals in our daily lives

Core Lesson Student Learning Objectives:

students will be able to

(E) demonstrate chemical compound atom counts

(I) simple chemical equation balancing

(I) Law of conservation of matter

(C) How to read a chemical equation

Core Lesson Essential Questions:

What are the Reactants of a chemical equation?

What are the Products?

How many atoms are present in the compound?

Core Lesson Big Ideas:

Counting the number of each chemical atom in a compound

Identifying the parts of the equation (reactants & products)

Completing simple chemical equation balancing

Demonstrating the Law of conservation of matter by balancing the equation

Learning to read a chemical equation

Core Lesson Materials:

notes,

worksheets

Content quizzes

Chapter tests

Core Lesson Key Terminology & Definitions:

(E) chemical bond attraction between atoms when electrons are shared, transferred, or pooled

(E) **chemical equation** description of a reaction using element symbols and chemical formulas

(E) **chemical reaction** process in which atoms of one or more substances rearrange to form one or more new substances

(E) coefficient number placed in front of an element symbol or chemical formula in an equation

(E) **law of conservation of mass** states that the total mass of the reactants before a chemical reaction is the same as the total mass of the products after the chemical reaction

(I) product new substance produced by a chemical reaction

(I) reactant starting substance in a chemical reaction

(C) combustion chemical reaction in which a substance combines with oxygen and releases energy

(C) synthesis chemical reaction in which two or more substances combine and form one compound

Unit: Unit 4. Matter and Energy

Timeline: February to March

Skills:

Students will be able to identify and model work

Students will be able to explain the transfer of thermal energy

Students will demonstrate an understanding of Newton's 3rd Law

Essential Questions:

What is energy?

What is the difference between kinetic energy and potential energy?

Is energy lost when it changes forms?

What is the law of conservation of energy?

Content:

(I) Energy and Energy Resources

What is work and what is power.

Where do we find resources, renewable, non renewable

(I) Thermal Energy

How is heat transferred to or between objects

Assessments: worksheets for practice of mathmatical formulas for Work, Power, Mass, Density

unit chapter tests

Lessons:

Energy and Energy Resources: Emphasize all lessons)

Lesson 1: Forms of Energy

Lesson 2: Energy transformations

Lesson Energy Resources

Thermal Energy: Emphasize all lessons

Lesson 1: Thermal Energy, Temperature, and Heat

Lesson 2: Thermal Energy Transfers

Lesson 3: Using Thermal Energy

Vocabulary:

Forms of Energy

Lesson 1

(E) electric: energy carried by an electric current

(E) energy: ability to cause change

(I) kinetic: energy due to motion

(I) mechanical energy: total energy of an object or group of objects due to large-scale motions and interactions

(I) nuclear energy: stored in the nucleus of an atom

(I) potential energy: stored energy due to interactions between objects or particles

(I) radiant: energy carried by electromagnetic waves

(I) sound: energy carried by sound

(E) thermal energy: sum of kinetic and potential energy of the particles in matter due to their random motion

(E) work: energy transfer to an object by a force, making the object move in the direction of the force

Lesson 2

(E) friction: force that resists the motion of two surfaces that are touching

(E) law of conservation of energy: states that energy can be transformed from one form into another or transferred from one region to another, but energy cannot be created or destroyed

(I) radiant: transmitted by electromagnetic waves

Lesson 3

(C) fossil: remains of an ancient organism

(E) Fossil fuel: nonrenewable energy resource made of the remains of ancient organisms and is burned as an energy source

(I) inexhaustible energy: resource energy resource that cannot be used up

(E) nonrenewable energy resource: energy resource that is used faster than it is replaced

(E) nuclei: positively charged centers of atoms

(E) renewable energy resource: energy resource that is replaced as fast as, or faster than, it is used

Resources: McGraw Hill Physical Science book

ConnectEd website & resources

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

MS-PS3-1 (Advanced)	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-PS3-2 (Advanced)	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-PS3-3 (Advanced)	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
MS-PS3-4 (Advanced)	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-PS3-5 (Advanced)	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-PS2-1 (Advanced)	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
MS-PS2-2 (Advanced)	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-PS2-3 (Advanced)	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
MS-PS2-4 (Advanced)	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
MS-PS2-5 (Advanced)	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.

Topic: Thermal Energy

Minutes for Topic: 42

Core Lesson Description:

How can thermal energy be used?

Thermal energy can be transferred by conduction, radiation, and convection. Thermal energy also can be transformed into other forms of energy and used in devices such as thermostats, refrigerators, and automobile engines.

Core Lesson Student Learning Objectives:

Lesson 1: Thermal Energy, Temperature, and Heat

Before you read: what students already know about thermal energy

Complete the lesson outline

be able to distinguish between thermal energy, kinetic energy & potential energy

be able to distinguish the major temperature scales

Lesson 2: Thermal Energy Transfers

Complete Lesson outline

be able to identify how thermal energy is transferred

distinguish between radiation, conduction and convection

Lesson 3: Using Thermal Energy

Complete Lesson outline

how do you transform energy

demonstrate how thermal energy is used in appliances

Core Lesson Essential Questions:

What is thermal energy?

How does thermal energy relate to temperature and heat?

How can thermal energy be used?

Core Lesson Materials:

MaGraw Hill Connected

Resources

Core Lesson Key Terminology & Definitions:

Lesson 1

(I) heat: movement of thermal energy from a warmer object to a cooler object

(E) kinetic energy: the energy an object or particle has because it is moving

(E) potential energy: stored energy temperature represents the average kinetic energy of the particles that make up a material

(E) thermal energy: sum of the kinetic energy and the potential energy of all the particles that make up an object

Lesson 2

(E) conduction: transfer of thermal energy between materials because of collisions between particles

(E) convection: transfer of thermal energy by the movement of particles from one part of a material to another

(I) convection current: movement of fluids in a cycle because of convection

(E) radiation: transfer of thermal energy from one material to another by electromagnetic waves

(E) specific heat: amount of thermal energy it takes to increase the temperature of 1 kg of material by 1°C

(I) thermal conductor: material through which thermal energy flows easily

(C) thermal contraction: decrease in a material's volume when the temperature is decreased

(C) thermal expansion: increase in a material's volume when the temperature is increased

(C) thermal insulator: material through which thermal energy does not flow easily

(E) vacuum: space that contains little or no matter

Lesson 3

(I) heat engine: machine that converts thermal energy into mechanical energy

(I) heating appliance: device that converts electric energy into thermal energy

(I) refrigerator: device that uses electric energy to pump thermal energy from a cooler location to a warmer location

(I) thermostat: a device that regulates the temperature of a system

STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.C.2.2.2 (Advanced)	Compare the time span of renewability for fossil fuels and the time span of renewability for alternative fuels.
S8.C.2.2.3 (Advanced)	Describe the waste (i.e., kind and quantity) derived from the use of renewable and nonrenewable resources and their potential impact on the environment.
S8.C.3.1.1 (Advanced)	Describe forces acting on objects (e.g., friction, gravity, balanced versus unbalanced).

S8.C.3.1.2 (Advanced)	Distinguish between kinetic and potential energy.
S8.C.3.1.3 (Advanced)	Explain that mechanical advantage helps to do work (physics) by either changing a force or changing the direction of the applied force (e.g., simple machines, hydraulic systems).

Topic: Kinetic Energy

Topic: Gas Laws

Topic: Brownian Motion

Unit: Unit 5. Motion and Forces

Timeline: March to April

Skills:

students will complete a webquest on simple machines demonstrating understanding of the reduction of "work" by machines.

students will demonstrate an understanding of force and the reactions there of that are demonstrated in Newton's First & Third laws.

Essential Questions:

What are some ways to describe motion?

What is Newton's Third Law of Motion?

What is a simple machine?

How do simple machines reduce the amount of work necessary?

Content:

(E) Describing Motion

Plan an investigation to provide evidence that the change in an objects motion depends on the sum of the forces on the object and the mass of the object

Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of it's speed

(I) The Laws of Motion

Apply Newton's First & Third Laws to design a solution to a problem involving two colliding objects

(I) Work and Simple Machines

conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other and objects not in contact.

Assessments:

Quizzes

Chapter Test

Labs

Journals

Homework

Classwork

Webquest: "Simple Machines"

Lessons:

Describing Motion

Lesson 1: Position and Motion (minimize)

Lesson 2: Speed and Velocity (minimize- except for vocabulary)

Lesson 3: Acceleration (minimize)

Laws of Motion

Lesson 1: Gravity and Friction: emphasize

Lesson 2: Newton's First Law: emphasize

Lesson 3: Newton's Second Law: Minimize

Lesson 4: Newton's Third Law: Minimize

Work and Simple Machines

Lesson 1: Work and Power: minimize (empathize equations W = Fd; P= W/t

Lesson 2: Using Machines: empathize vocabulary

Lesson 3: Simple Machines: emphasize awareness of machines and what they can do

Vocabulary:

(E) Displacement

(I) Dimension

(E) Motion

(E) Position

(C) Reference Point

(C) Realitive

(C) Specify

(I) Average Speed

(I) Constant Speed

(C) Instantaneous Speed

(E) Speed

(E) Velocity

Resources: connected McGraw Hill

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

MS-PS3-1 (Advanced) 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-PS3-2 (Advanced)	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-PS3-3 (Advanced)	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
MS-PS3-4 (Advanced)	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-PS3-5 (Advanced)	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.
STATE: Pennsylvania State Anchors (2010)	
S8.C.1 (Advanced)	Structure, Properties, and Interaction of Matter and Energy
S8.C.1.1.3 (Advanced)	Identify and describe reactants and products of simple chemical reactions.
S8.C.2.1 (Advanced)	Describe energy sources, transfer of energy, or conversion of energy.
S8.C.2.1.1 (Advanced)	Distinguish among forms of energy (e.g., electrical, mechanical, chemical, light, sound, nuclear) and sources of energy (i.e., renewable and nonrenewable energy)
S8.C.3 (Advanced)	Principles of Motion and Force
S8.C.3.1 (Advanced)	Describe the effect of multiple forces on the movement, speed, or direction of an object.
S8.C.3.1.1 (Advanced)	Describe forces acting on objects (e.g., friction, gravity, balanced versus unbalanced).
S8.C.3.1.2 (Advanced)	Distinguish between kinetic and potential energy.
S8.C.3.1.3 (Advanced)	Explain that mechanical advantage helps to do work (physics) by either changing a force or changing the direction of the applied force (e.g., simple machines, hydraulic systems).

Topic: Newton's Third Law

Topic: Position and Motion

Core Lesson Description:

•An object's position is its distance in a certain direction from a reference point.
•The position of an object in two dimensions can be described by choosing a reference point and two reference directions, and then stating the distance along each reference direction.
•The distance an object moves is the actual length of its path. Its displacement is the difference its initial position and its final position.

Core Lesson Essential Questions:

Why is a reference point useful in describing the position of a person or object?

How can you describe the position of an object in two dimensions?

What is the difference between distance and displacement?

Core Lesson Big Ideas:

An object's position is its distance in a certain direction from a reference point.
•The position of an object in two dimensions can be described by choosing a reference point and two reference directions, and then stating the distance along each reference direction.
•The distance an object moves is the actual length of its path. Its displacement is the difference its initial position and its final position.

Core Lesson Materials:	Connected - McGraw Hill reference material
Core Lesson Key Terminology & Definitions:	dimension: distance or length measured in one direction displacement: difference between initial position and final position of an object motion: process of changing position position object's distance and direction from a reference point reference point: starting point you choose to describe the location, or position, of an object relative compared to specify to indicate or identify

STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.C.3 (Advanced)	Principles of Motion and Force
S8.C.3.1 (Advanced)	Describe the effect of multiple forces on the movement, speed, or direction of an object.
S8.C.3.1.1 (Advanced)	Describe forces acting on objects (e.g., friction, gravity, balanced versus unbalanced).

Topic: Speed and Velocity

Core Lesson Description:	•Speed is the distance an object moves in a unit of time. •An object moving the same distance each second is moving at a constant speed. The speed of an object at a certain moment is its instantaneous speed. •You can calculate an object's average speed from a distance-time graph by dividing the distance the object travels by the total time it takes to travel that distance. •Velocity changes when speed, direction, or both speed and direction change.
Core Lesson Student Learning Objectives:	•Speed is the distance an object moves in a unit of time. •An object moving the same distance each second is moving at a constant speed. The speed of an object at a certain moment is its instantaneous speed. •You can calculate an object's average speed from a distance-time graph by dividing the distance the object travels by the total time it takes to travel that distance. •Velocity changes when speed, direction, or both speed and direction change.
Core Lesson Essential Questions:	How can motion change? What is speed? How can you determine average speed?
Core Lesson Big Ideas:	How can you use a distance time graph to calculate average speed? What are ways velocity can change? What do you measure to calculate speed?
Core Lesson Materials:	McGraw Hill resources
Core Lesson Key Terminology & Definitions:	average speed: distance divided by time constant speed: rate of change of position in which the same distance is traveled each second

instantaneous speed: speed at a specific instant in time speed distance an object travels per unit of time

velocity: speed and direction of a moving object

STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.C.3 (Advanced)	Principles of Motion and Force
S8.C.3.1 (Advanced)	Describe the effect of multiple forces on the movement, speed, or direction of an object.
S8.C.3.1.1 (Advanced)	Describe forces acting on objects (e.g., friction, gravity, balanced versus unbalanced).

Topic: Acceleration

Core Lesson Description: •Acceleration is a change in velocity over time. An object accelerates when it speeds up, slows down, or changes direction.
A speed-time graph shows the relationship between speed and time and can be used to determine information about the acceleration of an object

Core Lesson Essential Questions:

What is acceleration?

What does a speed time graph indicate about an object's motion?

What are 3 ways an object can accelerate?

Core Lesson Big Ideas: •Acceleration is a change in velocity over time. An object accelerates when it speeds up, slows down, or changes direction.
A speed-time graph shows the relationship between speed and time and can be used to determine information about the acceleration of an object

Core Lesson Key Terminology & Definitions:

(I) acceleration measure of the change in velocity during a period of time

(I) horizontal limit, divide, separate; x-axis on a graph

(I) vertical overhead; y-axis on a graph

STANDARDS

STATE: Pennsylvania State Anchors (2010)

S8.C.3 (Advanced)	Principles of Motion and Force
S8.C.3.1 (Advanced)	Describe the effect of multiple forces on the movement, speed, or direction of an object.
S8.C.3.1.1 (Advanced)	Describe forces acting on objects (e.g., friction, gravity, balanced versus unbalanced).

Topic: Power & Force

Core Lesson Description: In this lesson, students will learn the difference between work and power. They will learn the mathematical equations to find both

Core Lesson Student Learning Objectives: students will be able to distinguish between work and power and calculate the necessary amounts of energy to complete each.

Core Lesson Essential Questions: What is work? (E)

What is power? (E)

What is the equation for Power? (E)

What is the equation for Work? (E)

Core Lesson Big Ideas: How does doing work on an object change its energy? (E)

What must happen for work to be done? (E)

Core Lesson Materials: notes, worksheet, labs

Core Lesson Key Terminology & Definitions: Power (E)

Transfer (C)

Force (I)

Joule (E)

Force (C)

Unit: Unit 6: Waves, Electricity and Magnetism
Timeline: May to June

Skills: students will differentiate the mediums of waves and their travel

Essential Questions: What are waves?

How are the properties of waves related?

What are amplitude, wavelength, and frequency?

How do sound waves travel through a medium?

Can electromagnetic waves travel through empty space and matter?

What is the electromagnetic spectrum?

What is visible light?

What effect do lenses have on visible light?

What is electricity?

What is the difference between magnets and electromagnets?

Content: **(I) Wave properties:**

A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.

A soundwave needs a medium through which it is transmitted

(I) Electromagnetic Radiation:

When light shines on an objects, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency of the light.

The path of light can be traced in straight lines, except at surfaces between different transparent materials (air/water, air/glass), where the light path bends.

A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media.

However, because light can travel through space, it cannot be a matter wave, like sound or water waves.

(I) Types of Interactions:

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.

Assessments: chapter tests, quizzes

Lessons: **Wave properties:**

A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.

A soundwave needs a medium through which it is transmitted

Electromagnetic Radiation:

The path of light can be traced in straight lines, except at surfaces between different transparent materials (air/water, air/glass), where the light path bends.

A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media.

However, because light can travel through space, it cannot be a matter wave, like sound or water waves.

Types of Interactions:

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.

Vocabulary: **compression** region of a longitudinal wave where the particles in the medium are closest together

crest highest point on a transverse wave

electromagnetic wave can travel through empty space and through matter

energy ability to cause change

longitudinal wave makes the particles in a medium move parallel to the direction of the wave

mechanical wave travels only through matter

medium material in which a mechanical wave travels

rarefaction region of a longitudinal wave where the particles are farthest apart

transverse wave disturbance is perpendicular to the direction of the wave

trough lowest point on a transverse wave

wave disturbance that transfers energy from one place to another

amplitude maximum distance particles in a medium move from their rest position as waves pass through the medium

frequency number of wavelengths that pass by a point each second

wavelength distance from one point on a wave to the same point on the next wave

absorption transfer of energy by a wave to the medium through which it travels

constructive pertaining to building or putting parts together to make a whole

diffraction change in direction of a wave when it travels by the edge of an object or through an opening

interference waves that overlap combine to form a new wave

law of reflection angle of incidence equals angle of reflection

normal perpendicular to or forming a right angle with a line or plane

reflection bouncing of a wave off a surface

refraction wave changes direction, because its speed changes

transmission passage of light through an object

image figure, picture, or representation of an object

light electromagnetic radiation that you can see

reflection bouncing of a wave off a surface

Resources: McGraw Hill Physical Science

Connected website

STANDARDS:

STANDARDS

NGSS Arranged by Topic - Science (2013)

MS-PS1-1 (Advanced)	Develop models to describe the atomic composition of simple molecules and extended structures.
MS-PS1-3 (Advanced)	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
MS-PS1-4 (Advanced)	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.

Topic: Electromagnetic Spectrum

Core Lesson Description:	introduction to wavelengths and circuitry. This area is an optional section if time allows after PSSA testing in the Spring.
Core Lesson Student Learning Objectives:	Students will be able to identify the parts of the Electromagnetic Spectrum (lesson has already been taught in the Waves section, so this is a reinforcement section) and how the build-up of electrons allows for the conductivity of electricity
Core Lesson	What is the electromagnetic spectrum?

Essential Questions:	Why can't we see infrared or ultraviolet wavelengths?
Core Lesson Big Ideas:	The visible light spectrum is only a part of the electromagnetic spectrum. Our ability to interact with the waves depends on the wavelengths and frequency of the waves.
Core Lesson Materials:	prisms, flashlights, slinkies, notes, worksheets, videos
Core Lesson Key Terminology & Definitions:	**electromagnetic wave** can travel through empty space and through matter **radiant energy** is carried by an electromagnetic wave; also known as electromagnetic radiation **electromagnetic spectrum** entire range of electromagnetic waves with different frequencies and wavelengths **gamma ray** high-energy electromagnetic wave with a shorter wavelength and higher frequency than all other types of electromagnetic waves **infrared wave** electromagnetic wave that has a wavelength shorter than a microwave but longer than visible light **microwave** low-frequency, low energy electromagnetic wave that has a wavelength between about 1 mm and 30 cm **radio wave** low-frequency, low energy electromagnetic wave that has a wavelength longer than about 30 cm **ultraviolet wave** electromagnetic wave that has a slightly shorter wavelength and higher frequency than visible light, and carries enough energy to cause chemical reactions **X-ray** high-energy electromagnetic wave that has a slightly shorter wavelength and higher frequency than an ultraviolet wave **Polarized** electrons are concentrated in 1 area

Topic: Sound waves

Topic: Visible Light

Topic: Amplitude