Curriculum: Chambersburg Area SD Curriculum #2 PENNSYLVANIA

Course: Science 9th grade Physical Science Date: July 21, 2014 ET

Topic: Energy Days: 25

Subject(s): Science Grade(s): 9th

Key Learning:

Energy is found in many forms and may change from one form to another.

Unit Essential Question(s):

What are the different forms of energy and how does it change?

Concept: Forms of Energy 3.4.10.B, S11.C.2.2.2	Concept: Kinetic and Potential Energy 3.4.10.B	Concept: Energy Conversions 3.4.10.B, S11.C.2.1.3
Lesson Essential Question(s): What are the different forms of energy? (A) What are some everyday examples of the different fomrs of energy? (ET) What are the advantages and disadvantages of each type of energy? (ET)	**Lesson Essential Question(s):** What is the difference between kinetic and potential energy? (A) How are they calculated? (A) What are some everyday examples of kinetic and potential energy? (ET)	**Lesson Essential Question(s):** What are some of the converstions of energy from one form to another? (A) What are some everyday examples of energy converting from one form to another? (ET)
Vocabulary: energy, mechanical energy, chemical energy, electromagnetic energy, nuclear energy, heat, electrical, sound, light	**Vocabulary:** kinetic energy, potential energy, gravitational potential energy	**Vocabulary:** conservation of energy, energy conversion

Topic: Energy
Days: 25
Subject(s): Science
Grade(s): 9th

Concept: Heat Transfer (3.4.10.B)	Concept: Electric Charges and Currents (3.4.10.B, S11.C.2.1.4, S11.C.3.1.4)
Lesson Essential Question(s): What is heat and how does it transfer? (A) What is the relationship between temperature and heat? (ET) How is temperature measured? (A)	Lesson Essential Question(s): What is electric charge? (A) How do electric charges behave? (A) How are current, voltage, and resistance related? (ET) What are the components of the basic kinds of electric circuits? (A)
Vocabulary: heat, temperature, conduction, convection, radiation, thermometer	Vocabulary: electric charge, electric field, static electricity, electric discharge, friction charging, current, voltage, resistance, Ohm's Law, electric circuit, series circuit, parallel circuit, induction, absolute zero

Additional Information:

Attached Document(s):

Vocab Report for Topic: Energy Days: 25
Subject(s): Science Grade(s): 9th

Concept:

Forms of Energy

energy -

the ability to do work

mechanical energy -

the energy associated with the motion and position of everyday objects

chemical energy -

the energy stored in chemical bonds

electromagnetic energy -

a form of energy consisting of changing electric and magnetic fields

nuclear energy -

the energy stored in atomic nuclei

heat -

the transfer of thermal energy from one object to another because of a difference in temperature

electrical -

the energy associated with electrical charges

sound -

a kind of mechanical energy

light -

a kind of electromagnetic energy

Concept: Kinetic and Potential Energy

kinetic energy -

the energy an object has due to its motion

potential energy -

energy that is stored as a result of position or shape

gravitational potential energy -

the potential energy that depends upon an object's height above a reference point

Concept: Energy Conversions

conservation of energy -

a scientific law stating that energy can neither be created or destroyed

energy conversion -

the process of changing energy from one form to another

Concept: Heat Transfer

heat -

the transfer of thermal energy from one object to another because of a difference in temperature

temperature -

a measure of how hot or cold an object is compared to a reference point; a measure of the kinetic energy of molecules

conduction -

the transfer of thermal energy with no overall transfer of matter, within a material or between materials that are touching; the transfer of electric charge by direct contact with a conductor

convection -

the transfer of thermal energy when particles of fluid move from one place to another

radiation -

the transfer of energy by waves moving through space

thermometer -

an instrument that measures temperature

Concept: Electric Charges and Currents

electric charge -

a property that causes subatomic particles such as protons and electrons to attract or repel each other

electric field -

a field in a region of space that exerts electric forces on charged particles; a field produced by electric charges or by changing magnetic fields

static electricity -

the study of the behavior of electric charges, including how charge is transferred between objects

electric discharge -

a sudden release of electric charge

friction charging -

an accumulation of static charge by rubbing two objects together

current -

a continuous flow of electric charge

voltage -

potential difference, the difference in electrical potential energy between two places in an electric field

resistance -

the opposition to the flow of electric charges in a material

Ohm's Law -

the relationship of voltage, current, and resistance

Vocab Report for Topic: Energy Days: 25
Subject(s): Science Grade(s): 9th

electric circuit -

a complete path through which electric charge can flow

series circuit -

an electric circuit with only one path through which charge can flow

parallel circuit -

an electric circuit with two or more paths through which charge can flow

induction -

the transfer of charge without contact between materials

absolute zero -

a temperature of 0 Kelvin; the point at which no molecular motion exists

Curriculum: Chambersburg Area SD Curriculum #2

PENNSYLVANIA

Course: Science 9th grade Physical Science

Date: July 21, 2014 ET

Topic: Forces and Motion

Days: 50

Subject(s): Science

Grade(s): 9th

Key Learning:

Motion and forces are inter-related.

Unit Essential Question(s):

How are forces and motion related?

Concept: Motion 3.4.10.C, S11.C.3.1.1	Concept: Forces 3.4.10.C, S11.C.3.1.1	Concept: Fluid Dynamics 3.4.10.C
Lesson Essential Question(s): What are the differences between speed and velocity? How are they calculated? (A) What is acceleration? How is it calculated? (A) What is momentum? How is it calculated? (A) How are velocity, mass, and momentum related? (ET)	**Lesson Essential Question(s):** How do balanced and unbalanced forces affect motion? (A) What is the effect of friction on an object? (A) How do Newton's Laws explain how forces cause the motion of objects? (A) How does gravity affect an object? (A)	**Lesson Essential Question(s):** How do fluids move? (A) How do hydraulic devices multiply force? (A) How does the force of gravity affect the pressure of a fluid? (A) How does movement affect the pressure of a fluid? (A)
Vocabulary: speed, velocity, acceleration, momentum, mass, constant speed, average speed, frame of reference	**Vocabulary:** force, balanced forces, unbalanced forces, friction, inertia, gravity, weight, newton	**Vocabulary:** fluid, pressure, hydraulic device, depth, buoyancy, Archimedes principle, Bernoulli's principle, lift

Topic: Forces and Motion Days: 50
Subject(s): Science Grade(s): 9th

Concept:	Concept:
Work and Power 3.4.10.C, S11.C.3.1.5	**Simple Machines** 3.4.10.C, S11.C.3.1.5, S11.C.3.1.6
Lesson Essential Question(s): How do you know when work has been done? How is work calculated? (A) What is the difference between work and power? How is power calculated? (A) What factors affect the efficiency and mechanical advantage of a machine? (ET)	Lesson Essential Question(s): What are the six simple machines? (A) How do the simple machines make work easier? (A) What is the difference between a simple and compound machine? (A)
Vocabulary: work, power, joule, watt, efficiency, mechanical advantage, machine	Vocabulary: inclined plane, wedge, screw, lever, pulley, wheel and axle, simple machine, compound machine

Additional Information:

Attached Document(s):

Vocab Report for Topic: Forces and Motion Days: 50
Subject(s): Science Grade(s): 9th

Concept:

Motion

speed -

distance traveled per unit of time; rate of change of position

velocity -

the speed and direction an object is moving measured relative to a reference point

acceleration -

the rate at which velocity changes

momentum -

the product of an object's mass and its velocity

mass -

the amount of matter in an object

constant speed -

unchanging speed

average speed -

the total distance traveled divided by the time it takes to travel that distance

frame of reference -

a system of objects that are not moving relative to each other

Concept: Forces

force -

a push or a pull that acts on an object

balanced forces -

zero net force acting on an object which results in no change of motion or shape

unbalanced forces -

non-zero net force acting on an object which results in a change in motion or shape

friction -

a force that opposes the motion of objects that touch as they move past each other

inertia -

the tendency of an object to resist a change in its motion

gravity -

the attraction between any two objects because of their masses

weight -

the measure of force of gravity acting on an object

newton -

the SI unit for force, equal to the force that causes a 1-kg mass to accelerate at a rate of 1 meter per second squared (1N=1 kg·m/s2)

Concept: Fluid Dynamics

fluid -

a substance or a mixture that flows and has no shape of its own

pressure -

the result of a force distributed over an area

hydraulic device -

a device that uses a pressurized fluid acting on pistons of different sizes to increase force

depth -

the distance below the surface of a fluid

buoyancy -

the ability of a fluid to exert an upward force on an object placed in it

Archimedes principle -

the buoyant force on an object is equal to the weight of the fluid displaced by the object

Bernoulli's principle -

as speed of the fluid increases the pressure within the fluid decreases

lift -

an upward force due to a pressure difference between the top and bottom of a wing

Concept: Work and Power

work -

the product of distance and force in the direction an object moves

power -

the rate of doing work

joule -

the SI unit of work, equal to 1 newton-meter (1J=1N·m)

watt -

the SI unit of power, equal to one joule per second (1W=1 J/s)

efficiency -

the percentage of the work input that becomes the work output in a machine

mechanical advantage -

the number of times that a machine increases an output force

machine -

Vocab Report for Topic: Forces and Motion Days: 50
Subject(s): Science Grade(s): 9th

a device that changes the size of a force needed, the direction of a force, or the distance over which a force acts

Concept: Simple Machines

inclined plane -

a slanted surface along which a force moves an object to a different elevation

wedge -

a V-shaped object whose sides are two inclined planes sloped toward each other

screw -

an inclined plane wrapped around a cylinder

lever -

a rigid bar that is free to move around a fixed point

pulley -

a simple machine that consists of a rope that fits into a groove in a wheel

wheel and axle -

a simple machine that consists of two rigidly attached disks or cylinders, each one with a different radius

simple machine -

a machine that does work in a single movement

compound machine -

a combination of two or more simple machines that operate together

Curriculum: Chambersburg Area SD Curriculum #2 PENNSYLVANIA

Course: Science 9th grade Physical Science Date: July 21, 2014 ET

Topic: Introduction to Chemistry Days: 74

Subject(s): Science Grade(s): 9th

Key Learning:

All objects are made of matter. Matter undergoes different types of changes.

Unit Essential Question(s):

What is matter and how does it change?

Concept:	Concept:	Concept:
Physical and Chemical Properties of Matter 3.4.10.A, S11.C.1.1.2	**Physical and Chemical Changes in Matter** 3.4.10.A	**Elements, Compounds, and Mixtures** 3.4.10.A
Lesson Essential Question(s): What are the physical and chemical properties of matter? (A) What are the phase changes that occur in matter? (A) How does Kinetic Molecular Theory explain changes in phase? (A) How do Boyle's and Charles' Laws describe the behavior of gases? (A) What are examples of properties, phase changes, and gas law applications? (ET)	**Lesson Essential Question(s):** How are physical and chemical changes different? (A) What are the indicators that a physical or chemical (five indicators) change has taken place? (A) What are examples of physical and chemical changes that occur outside of class? (ET)	**Lesson Essential Question(s):** What are the characteristics of elements, compounds, and mixtures? (A) What are the different mixtures and how can physical properties be used to separate mixtures? (A) How are elements and compounds different? (A) How are compounds and mixtures different? (A) How can you determine the number of atoms in a compound? (ET)
Vocabulary: physical properties, chemical properties, mass, volume, density, state of matter, solid, liquid, gas, plasma, shape, hardness, melting point, boiling point, evaporation, condensation, sublimation, flammability, reactivity	**Vocabulary:** physical change, chemical change, chemical reaction, precipitate	**Vocabulary:** element, compound, mixture, molecule, homogenous mixture, heterogeneous mixture, solution, colloid, alloy, chemical formula, solute, solvent, solubility

Topic: Introduction to Chemistry
Days: 74
Subject(s): Science
Grade(s): 9th

Concept: Chemical Reactions (3.4.10.A)	Concept: Atomic Structure (3.1.10.C, 3.4.10.A, S11.C.1.1.1, S11.C.1.1.2)	Concept: Periodic Table (3.1.10.C, S11.C.1.1.4)
Lesson Essential Question(s): What are the differences between reactions and products? (A) Why must chemical equations be balanced (Conservation of Mass)? (A) What indicates that a chemical equation is balanced? (A)	Lesson Essential Question(s): What are the differences between the subatomic particles? (A) How can atomic structure be determined from a periodic table? (ET) How does atomic structure determine elemental properties? (A) How do we use models when studying atoms and their parts? (A)	Lesson Essential Question(s): How is the modern periodic table arranged? (A) How can a periodic table be used to determine the physical and chemical properties of the elements? (A) What are groups and periods? (A) What is the Periodic Law? (A) What are periodic properties? (A) What are properties of metals? Nonmetals? Metalloids? (A)
Vocabulary: reactant, product, chemical equation, conservation of mass, balanced equation, subscript, coefficient, endothermic, exothermic	Vocabulary: atom, proton, neutron, electron, electron cloud, nucleus, atomic mass number, atomic number, direct evidence, indirect evidence	Vocabulary: periodic table, periodicity, period, group, family, periodic law, oxidation number, valence number, metal, non-metal, metalloid

Concept: Chemical Bonding (3.1.10.C, 3.4.10.A, S11.C.1.1.3)	Concept: Acids/Bases (3.4.10.A)	Concept: Carbon Chemistry (3.4.10.A)
Lesson Essential Question(s): What are chemical bonds? (A) What are the different types of chemical bonds? (A) How is chemical bonding modeled using electron dot diagrams? (A) How are ionically and covalently bonded compounds different? (A)	Lesson Essential Question(s): What are the characteristics of acids? (A) What are the characteristics of bases? (A) What does a pH scale measure? (A) What is an indicator? What are some types? (A)	Lesson Essential Question(s): Why is carbon unique? (A)
Vocabulary: chemical bonding, covalent bond, ionic, metallic bond, crystal lattice, electron dot diagram, ion	Vocabulary: acid, base, pH scale, indicator, neutralization	Vocabulary: organic compounds, hydrocarbon, saturated hydrocarbon, unsaturated hydrocarbon, isomer

Topic: Introduction to Chemistry Days: 74
Subject(s): Science Grade(s): 9th

Additional Information:

The concepts of Acids/Bases and Carbon Chemistry are supplemental. They should be taught if instructional time allows.

Attached Document(s):

Vocab Report for Topic: Introduction to Chemistry Days: 74
Subject(s): Science Grade(s): 9th

Concept:

Physical and Chemical Properties of Matter

physical properties -

any characteristic of a material that can be observed or measured without changing the composition of the substances in the material

chemical properties -

any property that produces a change in the composition of matter

mass -

the amount of matter in an object

volume -

the amount of space taken up by an object

density -

the ratio of a material's mass to its volume; the amount of matter per unit volume of a material

state of matter -

the arrangement of the particles of a substance

solid -

the state of matter in which materials have a definite shape and a definite volume

liquid -

the state of matter in which a material has a definite volume but not a definite shape

gas -

the state of matter in which a material has neither a definite shape or a definite volume

plasma -

the state of matter in which atoms have been stripped of their electrons

shape -

the contour of an object

hardness -

a measure of the strength of a surface

melting point -

the temperature at which a solid changes to a liquid

boiling point -

the temperature at which a substance boils; the temperature at which vapor pressure is equal to atmospheric pressure

evaporation -

the process that changes a substance from a liquid to a gas at temperatures below the substance's boiling point

condensation -

the phase change in which a substance changes from a gas or vapor to a liquid

sublimation -

vapor without changing to a liquid first the phase change in which a solid changes directly to a gas or

flammability -

a material's ability to burn in the presence of oxygen

reactivity -

the property that describes how readily a substance combines chemically with other substances

Concept: Physical and Chemical Changes in Matter

physical change -

a change that occurs when some properties of a material change, but the substances in the material stay the same

chemical change -

change that occurs when a substance reacts and forms one or more new substances

chemical reaction -

the process of a chemical change

precipitate -

a solid that forms and separates from a liquid mixture

Concept: Elements, Compounds, and Mixtures

element -

a substance that cannot be broken down into simpler substances

compound -

a substance that is made from two or more simpler substances and can be broken down into those simpler substances

mixture -

a material made of two or more substances only physically joined together

molecule -

a neutral group of atoms that are joined together by one or more covalent bonds

homogenous mixture -

a type of mixture in which the substances are so evenly distributed that it is difficult to distinguish one substance in the mixture from another

heterogeneous mixture -

a type of mixture in which the parts of the mixture are noticeably different from one another

solution -

a mixture that forms when substances dissolve and form a homogenous mixture

colloid -

a mixture that contains some particles that are intermediate in size between the small particles in a solution and the larger particles in a suspension

alloy -

a mixture of two or more elements, at least one of which is a metal, that has the characteristic properties of a metal

chemical formula -

notation that shows what elements a compound contains and the ratio of the atoms or ions of these elements in the compound

solute -

a substance whose particles are dissolved in a solution

solvent -

a substance in which a solute dissolves

solubility -

the maximum amount of solute that normally dissolves in a given amount of solvent at a certain temperature

Concept: Chemical Reactions

reactant -

a substance that undergoes a change in a chemical reaction

product -

new substances formed as a result of a chemical reaction

chemical equation -

a representation of a chemical reaction n which the reactants and products are expressed as formulas

conservation of mass -

a scientific law stating that mass is neither created or destroyed in a chemical reaction

balanced equation -

a chemical equation that shows conservation of mass

subscript -

a number showing how many atoms of an element are present in a chemical formula

coefficient -

numbers that appear before a formula in a chemical equation to show the relative proportions of each reactant and product

endothermic -

a description of a change in which a system absorbs energy from its surroundings

exothermic -

a description of a change in which a system releases energy to its surroundings

Concept: Atomic Structure

atom -

the smallest particle of an element

proton -

a positively charged subatomic particle that is found in the nucleus of an atom

neutron -

a neutral subatomic particle that is found in the nucleus of an atom

electron -

a negatively charged subatomic particle that is found in the space outside the nucleus of an atom

electron cloud -

a visual model of the most likely locations for the electrons of an atom

nucleus -

the dense, positively charged mass located in the center of an atom

atomic mass number -

the sum of the number of protons and neutrons in the nucleus of an atom

atomic number -

a unique number for each element that equals the number of protons in an atom of that element

direct evidence -

information about something gained from observations

indirect evidence -

information about something gained without observations; deductions or inferences about something based on observations

Concept: Periodic Table

periodic table -

an arrangement of elements in columns, based on a set of properties that repeat from row to row

periodicity -

repeating in a regular pattern

period -

a row of the periodic table

group -

a column of elements on the periodic table

family -

a set of elements with similar physical and chemical properties

periodic law -

the pattern of repeating properties displayed by elements in the periodic table

oxidation number -

the number of valence electrons gained or lost by an element in a chemical reaction

valence number -

the number of electrons in the outermost energy level of an element

metal -

elements that are good conductors of heat and electric current

non-metal -

elements that are poor conductors of heat and electricity

metalloid -

elements with properties that fall between those of metals and nonmetals

Concept: Chemical Bonding

chemical bonding -

the force that holds atoms or ions together as a unit

covalent bond -

a chemical bond in which two atoms share a pair of valence electrons

ionic -

the force that holds cations and anions together

metallic bond -

the attraction between a metal cation and the shared electrons that surround it

crystal lattice -

a rigid, repeating arrangement of atoms

electron dot diagram -

a diagram of an atom, ion, or molecule in which each dot represents a valence electron

ion -

an atom or group of atoms that has a positive or negative charge

Concept: Acids/Bases

acid -

a compound that produces hydronium ions(H_3O^+) when dissolved in water; a proton donor

base -

a compound that produces hydroxide ions (OH^-) when dissolved in water; a proton acceptor

pH scale -

a measure of the hydronium ion concentration of a solution

indicator -

a substance that changes color in the presence of an acid or a base

neutralization -

a chemical reaction between an acid and a base

Concept: Carbon Chemistry

organic compounds -

compounds that contain carbon and hydrogen, often combined with a few other elements such as oxygen or nitrogen

hydrocarbon -

an organic compound that contains only the elements hydrogen and carbon

saturated hydrocarbon -

a hydrocarbon in which all of the bonds are single bonds

unsaturated hydrocarbon -

a hydrocarbon that contains one or more double or triple bonds

isomer -

organic compounds with the same molecular formulas but with different structural formulas

Curriculum: Chambersburg Area SD Curriculum #2

PENNSYLVANIA

Course: Science 9th grade Physical Science

Date: July 21, 2014 ET

Topic: The Nature of Science

Days: 20

Subject(s): Science

Grade(s): 9th

Key Learning:

Scientists use the scientific method to solve problems and must make measurements using the metric system.

Unit Essential Question(s):

How do scientists use the scientific method to solve problems?

Concept: The Scientific Method 3.2.10.A, 3.2.10.C, 3.2.10.D, S11.A.1.1.1	Concept: Measurements Made by Scientists 3.2.10.A, 3.2.10.B, S11.A.2.1.1	Concept: Presentation and Analysis of Data 3.1.10.A, 3.2.10.A, S11.A.3.1.3
Lesson Essential Question(s): What steps do scientists follow to solve problems? (A) How do scientists write a hypothesis? (A) How do you distinguish between a control and a variable? (A)	Lesson Essential Question(s): What are the measurements made by scientists? (A) What are the measurement units used by scientists? (A)	Lesson Essential Question(s): How is data organized? (A) How can data be presented? (A) How do you read a graph? (A) How can you construct a graph? (ET) What is a dependent variable and an independent variable (in terms of a graph)? (A)
Vocabulary: observation, qualitative, quantitative, hypothesis, controlled experiment, scientific theory, scientific law, variable	Vocabulary: mass, weight, volume, density, temperature, length, area, meter, liter, gram, celsius, second, metric system, time, precision, accuracy	Vocabulary: variable, unit, ordered pairs, data table, graph, independent variable, dependent variable, title, key

Additional Information:

Attached Document(s):

Vocab Report for Topic: The Nature of Science Days: 20
Subject(s): Science Grade(s): 9th

Concept:

The Scientific Method

observation -

information gained through the senses

qualitative -

an observation without a measurement

quantitative -

an observation with a measurement

hypothesis -

a proposed, testable answer to a question

controlled experiment -

an experiment in which only one variable, the manipulated variable, is deliberately changed at a time

scientific theory -

a well-tested explanation for a set of observations or experimental results

scientific law -

a statement of some natural phenomenon that has always been observed to be true

variable -

any factor that can change in an experiment

Concept: Measurements Made by Scientists

mass -

the amount of matter in an object

weight -

Vocab Report for Topic: The Nature of Science Days: 20
Subject(s): Science Grade(s): 9th

the force of gravity acting on an object

volume -

the amount of space taken up by an object

density -

the ratio of a material's mass to its volume; the amount of matter per unit volume of a material

temperature -

a measure of how hot or cold an object is compared to a reference point

length -

the straight-line distance between two points

area -

length times width, a measure of the size of a surface

meter -

the basic metric unit for length

liter -

the basic metric unit for volume

gram -

the basic metric unit for mass

celsius -

the basic metric unit of temperature

second -

the basic metric unit of time

metric system -

a measurement system based on powers of 10

time -

the duration of an event

precision -

a gauge of how exact a measurement is

accuracy -

the closeness of a measurement to the true value of what is measured

Concept: Presentation and Analysis of Data

variable -

any factor that can change in an experiment

unit -

a measurement of a quantity

ordered pairs -

two data points graphed together

data table -

a method for organizing results from an experiment

graph -

a method to visually organize data

independent variable -

manipulated variable - the variable that causes change in another variable

dependent variable -

responding variable - a variable that changes in response to a change in the manipulated variable

Vocab Report for Topic: The Nature of Science
Days: 20
Subject(s): Science
Grade(s): 9th

title -

an identifying name given to a graph

key -

a way of identifying the data on a graph