PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Applications of Physical Science

Grade Level: 11, 12

Date of Board Approval: 2017

Planned Instruction

Title of Planned Instruction: Applications of Physical

Science Subject Area: Science Grade(s):

11, 12

Course Description:

This course is a science elective designed to provide insights into the applications of physical science concepts to Delaware Valley's Career and Technical Education (CTE) program students. The course will include a mix of discovery learning, laboratory inquiry, and direct instruction. Main topics in this course include periodic table, matter, inference, chemical composition, atomic structure, chemistry of batteries, pH, gasses and pressure, introductory stoichiometry, Newton's Laws, pressure, work measurement, electricity, force and friction, energy conversion, fluid dynamic, and thermodynamics. Students will complete labs to develop their understanding of these concepts. They will complete lab reports to express their methods and findings. This course is designed to take place in 180 days.

Time/Credit for the Course: 180 days / 1 Credit

Curriculum Writing Committee: Megan Akaran, Jonathan McElhaney

Curriculum Map

Marking Period One

Everything Changes

Throughout the course of marking period one, students will learn how matter and energy change. Matter changes according to well defined Laws of Motion and Gravity. Students will learn how to express these laws using words, graphical representations, and models. This will enhance students' ability to apply knowledge of motion in various trades and real life settings.

Marking Period One –Goals:

To determine how motion of an object is related to interactions with other objects To determine how specific laws of physics effect motion
To understand that scientific methods share similar methods
To use standard measurement units strategically
To use visual displays of data strategically
To understand technology as the application of scientific knowledge to benefit people
To explain the movement of an object using position, speed, velocity, and acceleration
To explain how unbalanced forces change motion
To use Newton's laws of motion to explain real world phenomena

Understanding of:

- How the motion of an object is determined by the interactions between an object and other objects in the system
- How the relationship between the net force on an object, the mass of an object, and the acceleration of an object can be described by Newton's Second Law
- How one can describe and predict the effects of gravitational forces acting between masses using Newton's Law of Universal Gravitation
- How one can describe and predict the effect of electrostatic forces acting between electrically charged objects using Coulomb's Law

Marking Period Two

Nothing is Lost

Throughout the course of marking period two, students will gain understanding of energy. Energy is transferred in a variety of interactions that are measurable and predictable. Students will understand how energy is never gained or lost as a whole, but transferred in objects, liquids, and gasses. This will increase each student's ability to apply knowledge of how energy is transferred to their trades and other real life situations.

Marking Period Two -Goals:

To determine how energy changes are related to motion, interaction, or a transfer of energy To determine how the concept of the conservation of energy effects systems of objects
To determine how momentum changes based on transferred energy To determine how machines make doing work easier or faster
To understand energy as the ability to cause change
To understand that energy cannot be created or destroyed
To understand that atoms and molecules are in continuous, random motion To determine ways to transfer energy
To determine how to make thermal energy useful

Understanding of:

- How the energy an object has within a system depends on the object's motion and interactions with the other objects in that system
- How any change in an object's energy is the result of interactions with other objects in a system or a transfer of energy within a system
- How any energy gain or loss in a system will result in a corresponding energy loss or gain in another system
- How the concept of the conservation of energy in a system can be described and predicted using mathematical expressions for the kinetic and potential energy of objects
- How the transfer of energy through interactions of objects or systems of objects can cause a change in the momentum of objects or systems of objects
- How the total momentum within a system of interacting objects changes due to a transfer of momentum or energy into or out of a system

Marking Period Three

You Matter

Throughout the course of marking period three, students will come to understand the nature, structure, and properties of matter at the molecular level. Students will gain knowledge of the periodic table, properties associated with groups of elements, how the atomic structure changes based on the group and energy level on the periodic table. Students will complete activities and labs that will increase their understanding of molecules, compounds, and atoms.

Marking Period Three -Goals:

To determine the organizational structure of matter
To determine how the periodic table aids in our understanding of molecules and compounds To determine how to predict the behavior of molecules and compounds
To determine how to use the concept of a mole
To differentiate between matter that exists as a pure substance and matter that is a mixture To determine how a physical property can be observed without changing the material
To understand that a chemical property can be observed when new substances are formed To understand the structure of an atom
To understand how atoms of the same element are the same and how they can differ To understand the patterns that exist in the periodic table of elements

Understanding of:

- How minimizing electric potential energy results in stable forms of matter
- How one can break a bond by providing the binding energy to a stable molecule
- How the periodic table organizes elements according to number of protons and similar chemical properties
- How each atom has a charged substructure consisting of a nucleus, made of protons and neutrons, and surrounding electrons
- How ionic and covalent solutes have different solubilities based on their properties and factors such as dissolving and dissociating
- How one can describe and predict chemical reactions, calculate quantities of reactants and quantities of products based on the fact that atoms are conserved and the knowledge of chemical properties
- How the mole, the fundamental unit, is used to represent a specific quantity of atomic particles such as atoms, ions, formula units, and molecules
- How the kinetic molecular theory and Gas Laws are used to explain and predict the behavior of gases

Marking Period Four

We Interact

Throughout the course of marking period four, students will learn the differences between metals, nonmetals, and metalloids. They will learn how these elements form bonds, what equations represent these bonds, and the amount of certain elements and compounds needed to cause reactions. Students will learn to predict the outcome of reactions based on the rules of naming compounds, classification of reaction, rate of reaction, and stoichiometry. This will enable each student to have a better understanding of what is happening in reactions that occur in their trades and throughout their lives.

Marking Period Four -Goals:

To determine how knowledge of chemical properties is used to predict and describe interactions
To determine the characteristics of metals, nonmetals, and metalloids
To determine why compounds are more stable than the elements that make them up To determine the conditions that result in ionic or covalent bonds
To write names and chemical formulas for compounds
To write balanced chemical equations
To classify chemical reactions
To explain the role of energy in chemical reactions
To explain how the rate of a reaction can be changed

Understanding of:

- How properties of chemical compounds are related to electrostatic interaction between particles
- How electrical forces within and between atoms determine the structure and interactions of matter at the bulk scale
- How the arrangement and energy of colliding particles and the subsequent rearrangement of atoms explains chemical processes, their rates, and energy changes
- How one can describe and predict chemical reactions based on knowledge of chemical properties of the elements involved and knowing that atoms are conserved
- How the total number of neutrons plus protons does not change in any nuclear process
- How pH is a log scale that reflects the concentration of protons in a solution

UNIT 1: Everything Changes

Big Idea # 1: Interactions between any two objects can cause changes in one or both of them

Essential Questions:

- How can one explain and predict interactions between objects within systems?

Concepts:

The motion of an object is determined by the interactions between the object and any other objects in the system

Newton's Second Law provides a mathematical model that describes the relationship between the net force on an object, the mass of the object, and the acceleration of the object

Newton's Law of Universal Gravitation provides a mathematical model that describes and predicts the effects of gravitational forces acting between masses

Coulomb's Law provides a mathematical model that describes and predicts the effect of electrostatic forces acting between electrically charged objects

Competencies:

Construct an explanation for the motion of an object based on the interactions that occur between the object and other objects in the system

Plan and carry out investigations to show how the relationship of Newton's Second Law of motion accurately predicts the relationship between the net forces of the object, their mass, and the resulting change in motion

Use mathematical representations of Newton's Law of GRavitation to describe and predict the gravitational forces between objects

Use mathematical representations of Coulomb's Law to describe and predict the electrostatic forces between objects

UNIT 2: Nothing is Lost

Big Idea # 1: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation

Essential Questions:

- How is energy transferred and conserved?

Concepts:
The energy an object has within a system depends on the object's motion and interactions with other objects in that system

Any change in an object's energy is the result of interactions with other objects in a system or a transfer of energy between systems, changing the total energy of the systems involved

Any energy gain or loss in a system will result in a corresponding energy loss or gain in another system

Mathematical expressions for the kinetic and potential energy of objects allow for the concept of the conservation of energy to be used to describe and predict the behavior of objects in a system

The transfer of energy through interactions of objects or systems of objects cause a change in the momentum of objects or systems of objects

For any system of interacting objects, the total momentum within the system changes due to transfer of momentum or energy into or out of the system

Competencies:

Construct an explanation for the energy that an object has in a system based on the object's motion and the object's interaction with other objects in the system

Develop and use a model to explain how an object's energy is transferred or transformed as objects interact within a system

Identify problems and suggest solutions to optimize the energy transfer between objects or systems of objects

Construct mathematical models to show how energy is transformed and transferred within a system

Plan and carry out an investigation to provide evidence that energy is conserved in a system

Generate and analyze data to support the claim that the total momentum of a closed system of objects is conserved

Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision

UNIT 3: You Matter

Big Idea # 1: Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms

Essential Questions:

- How can one explain the structure, properties, and interactions of matter

Concepts:

Stable forms of matter are those in which the electric potential energy is minimized

A stable molecule has lower energy, by an amount known as binding energy, than the same set of atoms separated. This energy must be provided to break the bond

Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons

The periodic table orders elements in increasing number of protons and places those with similar chemical properties in columns

The solubility of solutions depends on their properties and other factors e.g. dissolving, dissociating

Competencies:

Construct models showing that stable forms of matter are those with minimum electrical field energy

Construct models showing that energy is needed to break bonds and overcome intermolecular forces and that energy is released when bonds form (Enthalpy, Lattice energy are not included)

Use the atomic model and periodic table to predict and explain trends in properties of elements Develop

a model showing the likely position of electrons as determined by the quantized energy levels of atoms

Develop explanations and/or mathematical expressions comparing solutions made from ionic and covalent solutes and how various factors affect the solubility of these solutions

Analyze and interpret data sets, using the mole concepts, to mathematically determine the amounts of representative particles in macroscopic measurable quantities

UNIT 4: We Interact

Big Idea # 1: Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms

Essential Questions:

- How can one explain the structure, properties, and interactions of matter

Concepts:
The fact that atoms are conserved, together with knowledge of chemical properties of the elements involved, can be used to describe and predict chemical reactions and calculate quantities of reactants and products

The mole, as a fundamental unit, is used to represent a specific quantity of atomic particles such as atoms, ions, formula units, and molecules

The kinetic molecular theory and Gas Laws are used to explain and predict the behavior of gases

Chemical processes, their rates, and energy changes can be understood in terms of the arrangement and energy of colliding particles and the subsequent rearrangement of atoms

The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions

Competencies:
Analyze and interpret data to apply the laws of definite proportions and multiple proportions, to determine empirical and molecular formulas of compounds, percent composition and mass of elements in a compound

Utilize mathematical relationships to predict changes in the number of particles (moles), the temperature, the pressure, and the volume in a gaseous system (i.e., Boyle's Law, Charles' Law, Avogadro's Law, Dalton's Law of partial pressures, the combined gas law, and the ideal gas law)

Use models to understand the effect of concentration, temperature, and surface area on frequency of collisions and subsequently rate. Describe the function of catalysts.

Develop and use models to explain that atoms (and therefore mass) are conserved during a chemical reaction. Models can include computer models, ball and stick models, and drawings

Develop a model for chemical systems to support/predict changes in reaction conditions limited to simple equilibrium reactions

Apply a systematic set of rules (IUPAC) for naming compounds and writing chemical formulas (e.g., binary covalent, binary ionic, ionic compounds containing polyatomic ions)

Utilize significant figures to communicate the precision in a quantitative observation. Calculate error and percent error given experimental data and the accepted value.

Curriculum Plan

Unit1:EverythingChanges TimeRangeinDays:45

Standard(s):

SAS: 3.2.P.B1, 3.2.P.B6, 3.2.12.B6, 3.2.12.B4

Common Core: CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H , CC.3.5.9-10.I, CC.3.5.9-10., CC.3.6.9-10.A,, CC.3.6.9-10.B, CC.3.6.9-10.C, CC.3.6.9-10.D, CC.3.6.9-10.E, CC.3.6.9-10.F, CC.3.6.9-10.G, CC.3.6.9-10.H, CC.3.6.9-10.I

Overview:

Throughout the course of marking period one, students will learn how matter and energy change. Matter changes according to well defined Laws of Motion and Gravity. Students will learn how to express these laws using words, graphical representations, and models. This will enhance each student's ability to apply knowledge of motion in various trades and real life settings.

Focus Question(s):

How can one explain and predict interactions between objects within systems?
What steps do scientists use to solve problems? Why do scientists use variables?
What is the difference between scientific law and scientific theory?
What are the SI units and symbols for length, volume, mass, density, time, and temperature?
How can related SI units be converted?
What are the three types of graphs, and how are they used?
How are the dependent and independent variables expressed in a graph? How
can you analyze data using the various types of graphs?
Why might the value of technology vary for different people at different times?
How can consumers affect technological development?
How are distance and displacement different?
How is an objects speed calculated? What information does a distance-time graph provide?
What is the difference between speed and velocity?
How is the motion of two objects relative to each other described?

How can an object's momentum be calculated?
How are acceleration, time, and velocity related?
What are three ways an object can accelerate? How can an objects acceleration be calculated?
What are the similarities and differences between straight line motion, circular motion, and projectile motion?
How are force and motion related? How is the net force of an object determined? Why is there friction between objects?
What is the difference between mass and weight?
What is inertia and how is it related to Newton's first law of motion?
How can an object's acceleration be calculated using Newton's second law of motion?
According to Newton's third law of motion, how are the forces between interacting objects related?
How does Newton's first law explain what happens in a car crash?
How does Newton's second law explain the effects of air resistance?
When is momentum conserved?

Goals:

To determine how motion of an object is related to interactions with other objects
To determine how specific laws of physics effect motion
To understand that scientific methods share similar methods To use standard measurement units strategically
To use visual displays of data strategically
To understand technology as the application of scientific knowledge to benefit people
To explain the movement of an object using position, speed, velocity, and acceleration
To explain how unbalanced forces change motion
To use Newton's laws of motion to explain real world phenomena

Objectives:

- Summarise the steps scientists might use to carry out an investigation using scientific methods (DOK 2)
- Explain why a theory cannot become a law (DOK 2)
- Choose an appropriate SI unit of measure depending on an object's size (DOK 3)
- Convert from one SI unit to another to solve problems (DOK 3)
- Compare and contrast the features and uses of line, bar, and circle graphs (DOK 3)
- State the characteristics of independent and dependent variables (DOK 1)
- Define technology and how it can be influenced by the individual (DOK 1/3)
- Describe the differences between average speed and constant speed (DOK 3)

- Describe motion of an object using *position*, *displacement*, *distance*, and *speed* (DOK 2)
- Describe the velocity of an object. Differentiate between speed and velocity (DOK 3)
- Calculate the momentum of an object (DOK 1)
- Explain acceleration in terms of time and velocity (DOK 1)
- Compare how forces, including friction and gravity, affect movement of an object (DOK 2)
- Explain the motion of objects in varying situations using Newton's Laws of motion (DOK 4)

Core Activities and Corresponding Instructional Methods(Including but not limited to):

- Motion Graphs Lab (Chapter 2, Lab 1)- Experiential Instruction
- Momentum of Colliding Objects Lab (Chapter 2, Lab 2)- Experiential Instruction
- What Science is and What it Isn't (Chapter 1, Web Quest)- Experiential Instruction
- Motion from Different Forces (Chapter 3, Lab 2B)- Experiential Instruction
- Reading Essentials (online resource)-Interactive Instruction
- Foldables (from textbook)-Indirect Instruction
- Science Notebook (online resource)-Indirect Instruction

Assessments (Including but not limited to the following):

Diagnostic:

- Pre-test (designed by teacher)
- Graphic organizers
    - KWL

charts Formative:

- Observations
- White boards
- Oral responses
- Foldables (from textbook)
- Launch Lab (from textbook)
- Reading Check questions (from textbook)
- Mini Lab (from textbook)
- Section Review (from textbook)
- Daily Intervention (from teacher textbook)
- Assessment Portfolio (from teacher textbook)
- Lab Reports (from textbook / online resources)
- Directed Reading (online resources)

- Vocabulary eGames (online resources)

Summative:

- Glencoe Physical Science e-Assessment (online resources)
- Project Based Learning (online resources)
- LearnSmart online assessment tool (online resources)
- Standardized Test Practice (Spanish and English) (online resources)
- Chapter Tests A, B, and C (online resources)
- Assessment Transparency (online resources)
- Mastering Standardized Test (online resources)
- Section Review (from textbook)
- Unit 1 STEM Project (from textbook)
- Lab Reports (from textbook and online resources)
- Chapter Review (from textbook)

Extensions:

- Section Focus Visual and Worksheet (online resources)

  Enrichment

  MiniLab Worksheet

  Online Section Quizzes (English/Spanish)

- Additional lab activities

  Create a Care Package (Chapter 1, Lab 2)

  Measure the Parking Lot (teacher created)

Correctives:

- Science Notebook (online resources)
- Reading Essentials (online resources)
- Section Focus Visual and Worksheet (online resources)

  Directed Reading for Content Mastery (English/Spanish)

  Reinforcement

- Additional Lab Activities

  Effects of Air Resistance (Chapter 3, Lab 1)

Materials and Resources:

Primary Textbook McGraw-Hill Education GlencoePhysicalScience Unit

1 Chapter 1: The Nature of Science

Chapter 2:Motion

Chapter 3 Forces and Newton’s Laws

GlencoePhysicalScience Section Review

GlencoePhysicalScience Science Notebook

GlencoePhysicalScience Reading Essentials

GlencoePhysicalScience e Assessment

Unit2: NothingisLost TimeRangeinDays:45

Standard(s):

SAS: 3.2.P.B2, 3.2.P.B6, 3.2.12.B2, 3.2.12.B6

Common Core: CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H , CC.3.5.9-10.I, CC.3.5.9-10., CC.3.6.9-10.A,, CC.3.6.9-10.B, CC.3.6.9-10.C, CC.3.6.9-10.D, CC.3.6.9-10.E, CC.3.6.9-10.F, CC.3.6.9-10.G, CC.3.6.9-10.H, CC.3.6.9-10.I

Overview:

Throughout the course of marking period two, students will gain understanding of energy. Energy is transferred in a variety of interactions that are measurable and predictable. Students will understand how energy is never gained or lost as a whole, but transferred in objects, liquids, and gasses. This will increase each student's ability to apply knowledge of how energy is transferred to their trades and other real life situations.

Focus Question(s):

How is energy transferred and conserved?
What is work? How can work be calculated when force and motion are parallel to each other?
How do machines make doing work easier? What are mechanical advantage and efficiency? What is the difference between kinetic energy and potential energy?
How can you calculate kinetic energy? What are some different forms of potential energy? How can you calculate gravitational potential energy?
What is the law of conservation of energy?
What is mechanical energy? Why is mechanical energy not always conserved?
How are power and energy related?
What is temperature? How are thermal energy and temperature related?
What is the difference between thermal energy and heat?
How do you calculate changes in thermal energy?
What are conduction, convection, and radiation?
How do thermal conductors differ from thermal insulators?
How are thermal insulators used to control the transfer of thermal energy? What are some common types of heating systems?
What are the first and second laws of thermodynamics?

How does an internal combustion engine work? How does a refrigerator work? How do gravitational force and electric force compare?
What is the difference between conductors and insulators? How can objects become electrically charged?
When and how does a voltage difference produce an electric current?
How do batteries produce a voltage difference in a circuit?
How does Ohm's law relate current, voltage difference, and resistance? How do series circuits differ from parallel circuits?
What is the function of a circuit breaker? How can you calculate electrical power?
How can you calculate the cost of using an electrical appliance?

Goals:

To determine how energy changes are related to motion, interaction, or a transfer of energy To determine how the concept of the conservation of energy effects systems of objects
To determine how momentum changes based on transferred energy To determine how machines make doing work easier or faster
To understand energy as the ability to cause change
To understand that energy cannot be created or destroyed
To understand that atoms and molecules are in continuous, random motion To determine ways to transfer energy
To determine how to make thermal energy useful Objectives:

- Give examples of machines that increase speed, change the direction of force, and increase force (DOK 1)
- Differentiate between changes caused by kinetic energy and changes that involves potential energy (DOK 3)
- Apply the law of conservation of energy to various real world situations (DOK 4)
- Explain transformations of energy involving mechanical energy (DOK 3)
- Explain how the motion of particles that make up an object change when the object's temperature changes (DOK 3)
- Explain how the temperature of an object is measured and how heat is transferred (DOK 2)
- Contrast the following methods of thermal energy transfer and their best uses: conduction, convection, radiation (DOK 3)
- Explain real world situations in terms of thermal insulators (ex. Why do some houses still have snow on their roof after several days when others do not?) (DOK 3)

- Describe a device that transforms thermal energy into another useful form (DOK 2)
- Explain how the laws of thermodynamics apply to household heating and cooling items (DOK 4)

Core Activities and Corresponding Instructional Methods:

- Mechanical Advantage and Efficiency (Chapter 4, Lab 1)
- Convection in Gases and Liquids (Chapter 5, lab 1)
- Conduction in Gases (Chapter 5, Lab 2A)
- Compare Series and Parallel Circuits (Chapter 6, lab 2A)
- Reading Essentials (online resource)-Interactive Instruction
- Foldables (from textbook)-Indirect Instruction
- Science Notebook (online resource)-Indirect Instruction

Assessments (Including but not limited to):

Diagnostic:

- Pre-test (designed by teacher)
- Graphic organizers
    - KWL

charts Formative:

- Observations
- White boards
- Oral responses
- Foldables (from textbook)
- Launch Lab (from textbook)
- Reading Check questions (from textbook)
- Mini Lab (from textbook)
- Section Review (from textbook)
- Daily Intervention (from teacher textbook)
- Assessment Portfolio (from teacher textbook)
- Lab Reports (from textbook / online resources)
- Directed Reading (online resources)
- Vocabulary eGames (online resources)

Summative:

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- Standardized Test Practice (Spanish and English) (online resources)
- Chapter Tests A, B, and C (online resources)
- Assessment Transparency (online resources)
- Mastering Standardized Test (online resources)
- Section Review (from textbook)
- Unit 2 STEM Project (from textbook)
- Lab Reports (from textbook and online resources)
- Chapter Review (from textbook)

Extensions:

- Section Focus Visual and Worksheet (online resources)

  Enrichment

  MiniLab Worksheet

  Online Section Quizzes (English/Spanish)

- Additional lab activities

  Swinging Energy (Chapter 4, Lab 2A)

  Conduction in Gases (Chapter 5, Lab 2B)

  Compare Series and Parallel Circuits (Chapter 6, lab 2B)

Correctives:

- Science Notebook (online resources)
- Reading Essentials (online resources)
- Section Focus Visual and Worksheet (online resources)

  Directed Reading for Content Mastery (English/Spanish)

  Reinforcement

- Additional lab activities

  Insulators and Conductors (Chapter 6, Lab 1)

Materials and Resources:

Primary Textbook- Glencoe Physical Science, McGraw-Hill Education, 2017 Unit 2

Chapter 4: Work and Energy

Chapter 5:Thermal Energy

Chapter 6: Electricity

Glencoe Physical Science Section Review

Glencoe Physical Science Science Notebook

Glencoe Physical Science Reading Essentials

Glencoe Physical Science e Assessment

Unit3: YouMatter TimeRangeinDays:45

Standard(s):

SAS: 3.2.C.A1, 3.2.C.A5, 3.2.12.A2, 3.2.1.C.A2, 3.2.10.A4, 3.4.10.A, 3.2.10.A1, 3.2.10.A5, 3.2.C.A4, 3.2.12.A1

Common Core: CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H , CC.3.5.9-10.I, CC.3.5.9-10., CC.3.6.9-10.A,, CC.3.6.9-10.B, CC.3.6.9-10.C, CC.3.6.9-10.D, CC.3.6.9-10.E, CC.3.6.9-10.F, CC.3.6.9-10.G, CC.3.6.9-10.H, CC.3.6.9-10.I

Overview:

Throughout the course of marking period three, students will come to understand the nature, structure, and properties of matter at the molecular level. Students will gain knowledge of the periodic table, properties associated with groups of elements, how the atomic structure changes based on the group and energy level on the periodic table. Students will complete activities and labs that will increase their understanding of molecules, compounds, and atoms.

Focus Question(s):

How can one explain the structure, properties, and interactions of matter?
What is the kinetic theory of matter?
How do particles move in different states of matter?
How do particles behave at the boiling and melting points?
What are applications of Archimedes', Pascal's, and Bernoulli's principles
How does gas exert pressure on its container?
How is gas affected when pressure, temperature, or volume change?
What are the differences between substances and mixtures?
How are elements and compounds identified?
How are suspensions, solutions, and colloids related?
What are physical and chemical properties?
What are the differences and similarities of physical and chemical changes?
How does the law of conservation of mass apply to chemical changes?
What are the names and symbols of common elements? What is the structure of the atom?
How do scientists study quarks?
What is the electron cloud model of the atom?

How do you determine the atomic mass and mass number of an atom? What are isotopes?
How do you determine the average atomic mass of an element?
How is the periodic table organized? What are the trends on the periodic table? Goals:

To determine the organizational structure of matter
To determine how the periodic table aids in our understanding of molecules and compounds
To determine how to predict the behavior of molecules and compounds
To determine how to use the concept of a mole
To differentiate between matter that exists as a pure substance and matter that is a mixture To determine how a physical property can be observed without changing the identity of the material
To understand that a chemical property can be observed when one or more new substances are formed
To understand the structure of an atom
To understand how atoms of the same element are the same and how they can differ To understand the patterns that exist in the periodic table of elements

Objectives:

- Describe the movement of the particles in solids, liquids, and gases (DOK 1)
- Describe how particles of a substance behave at its melting and boiling points (DOK 1)
- Describe how fluids exert forces on objects in real world situations (DOK 4)
- Apply Boyle's law and Charles's law about gases to real world situations (DOK 4)
- Compare the properties of suspensions, colloids, and solutions (DOK 2)
- Contrast a substance and a mixture; Contrast a homogenous mixture and a compound (DOK 3)
- Explain differences between physical and chemical changes in terms of liquids (DOK 4)
- Identify the charge, name, and location of three types of subatomic particles that make up an atom (DOK 1)
- Identify the chemical symbols of common elements (DOK 1)
- Determine mass numbers and atomic numbers for specific element (DOK 2)
- Compare and contrast how the isotopes of an element are alike and different (DOK 2)
- Identify patterns in the periodic table to obtain information about elements (DOK 2)

Core Activities and Corresponding Instructional Methods:

- Conservation of Mass (Chapter 15, Lab 2 A or B)

- Properties of Metals, Nonmetals, and Metalloids (Chapter 16, Lab 2 A or B)
  - Reading Essentials (online resource)-Interactive Instruction
- Foldables (from textbook)-Indirect Instruction
- Science Notebook (online resource)-Indirect Instruction

Assessments (Including but not limited to):

Diagnostic:

- Pre-test (designed by teacher)
- Graphic organizers
  - KWL

charts Formative:

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- Section Review (from textbook)
- Daily Intervention (from teacher textbook)
- Assessment Portfolio (from teacher textbook)
- Lab Reports (from textbook / online resources)
- Directed Reading (online resources)
- Vocabulary eGames (online resources)

Summative:

- Glencoe Physical Science e-Assessment (online resources)
- Project Based Learning (online resources)
- LearnSmart online assessment tool (online resources)
- Standardized Test Practice (Spanish and English) (online resources)
- Chapter Tests A, B, and C (online resources)
- Assessment Transparency (online resources)
- Mastering Standardized Test (online resources)
- Section Review (from textbook)
- Unit 4 STEM Project (from textbook)
- Lab Reports (from textbook and online resources)

- Chapter Review (from textbook)

Extensions:

- Section Focus Visual and Worksheet (online resources)

  Enrichment

  MiniLab Worksheet

  Online Section Quizzes (English/Spanish)

- Additional lab activities

  Test the Viscosity of Common Liquids (Chapter 14, lab

A,B) Correctives:

- Science Notebook (online resources)
- Reading Essentials (online resources)
- Section Focus Visual and Worksheet (online resources)

  Directed Reading for Content Mastery (English/Spanish)

  Reinforcement

- Additional lab activities

  Determining Energy for Phase Changes (Chapter 14, Lab

  1) Pure Substances and Mixtures (Chapter 15, Lab 1)

  A Periodic Table of Foods (Chapter 16, Lab 1)

Materials and Resources:

Primary Textbook- GlencoePhysicalScience McGraw-Hill Education, 2017 Unit

4 Chapter 14: Solids, Liquids, and Gases

Chapter 15: Classification of Matter

Chapter 16: Properties of Atoms and the Periodic Table

GlencoePhysicalScience Section Review

GlencoePhysicalScience Science Notebook

Glencoe Physical Science Reading Essentials

Glencoe Physical Science e Assessment

Unit4:WeInteract TimeRangeinDays:45

Standard(s):

SAS: 3.2.C.A, 3.2.C.A1, 3.2.C.A2, 3.2.C.A3, 3.2.C.A4, 3.2.C.A5, 3.2.10.A, 3.2.10.A1, 3.2.10.A4, 3.2.10.A5, 3.2.12.A, 3.2.12.A1, 3.2.12.A2, 3.2.12.A5

Common Core: CC.3.5.9-10.A, CC.3.5.9-10.B, CC.3.5.9-10.C, CC.3.5.9-10.D, CC.3.5.9-10.E, CC.3.5.9-10.F, CC.3.5.9-10.G, CC.3.5.9-10.H , CC.3.5.9-10.I, CC.3.5.9-10., CC.3.6.9-10.A,, CC.3.6.9-10.B, CC.3.6.9-10.C, CC.3.6.9-10.D, CC.3.6.9-10.E, CC.3.6.9-10.F, CC.3.6.9-10.G, CC.3.6.9-10.H, CC.3.6.9-10.I

Overview:

Throughout the course of marking period four, students will learn the differences between metals, nonmetals, and metalloids. They will learn how these elements form bonds, what equations represent these bonds, and the amount of certain elements and compounds needed to cause reactions. Students will learn to predict the outcome of reactions based on the rules of naming compounds, classification of reaction, rate of reaction, and stoichiometry. This will enable each student to have a better understanding of what is happening in reactions that occur in their trades and throughout their lives.

Focus Question(s):

What are the properties of metals, nonmetals, and metalloids? How do atoms bond in metallic bonding?
What elements are alkali metals and which are alkaline earth metals? What are some common uses of the transition elements?
What properties of hydrogen make it a nonmetal?
How are the allotropes of carbon similar and how are they different?
What does the term semiconductor mean?
What is the difference between natural and synthetic elements?
How can one explain the structure, properties, and interactions of matter?
How does a compound differ from its component elements?
What does a chemical formula represent?
How do electron dot diagrams help predict chemical bonding?
Why does chemical bonding occur? What are ionic and covalent bonds?
Which particles are produced by different types of bonding?

How do nonpolar and polar covalent bonds compare? How
are oxidation numbers determined?
What are reactants and products in a chemical reaction? Is
mass converted in a chemical reaction?
Why are chemical equations important? How do you balance a chemical equation? What
are the five general types of chemical reactions?
How can you predict if a metal will replace another in a compound?
What do the terms oxidation and reduction mean? How are redox reactions identified? How
can the source of energy changes in chemical reactions be identified?
How do exergonic and endergonic reactions compare?
How do exothermic and endothermic reactions compare?
Is energy conserved during a chemical reaction?
How do chemists express the rates of chemical reactions? How
do catalysts and inhibitors affect reaction rates?
What is equilibrium? How does Le Chatelier's principle explain shifts in

equilibria? Goals:

To determine how knowledge of chemical properties is used to predict and describe interactions
To determine how nuclear processes can be predicted and described
To determine the characteristics of metals, nonmetals, and metalloids
To determine why compounds are more stable than the elements that make them up To
determine the conditions that result in ionic or covalent bonds
To write names and chemical formulas for compounds
To write balanced chemical equations
To classify chemical reactions
To explain the role of energy in chemical reactions
To explain how the rate of a reaction can be changed Objectives:

- Classify metals based on their oxidation states (DOK 2)
- Predict the behavior of elements based on the number of electrons in the outer level (DOK 3)
- Contrast metals and nonmetals; Describe how nonmetals combine with other elements (DOK 2)
- Describe the characteristics of metalloids (DOK 2)

- Explain why some elements are stable on their own while others are more stable in compounds (DOK 2)
- Describe why chemical bonding occurs (including electron dot diagrams) (DOK 3)
- Compare and contrast ionic and covalent bonds (DOK 3)
- Write formulas for common compounds; write names for common compounds (DOK 1)
- Identify reactants and products in chemical equations (DOK 1)
- Explain the law of conservation of mass (DOK 2)
- Classify reactions as combustion, synthesis, decomposition, single displacement, or double displacement (DOK 2)
- Compare and contrast what happens in each of the five basic classes of chemical reactions (DOK 3)
- Contrast endothermic and exothermic reactions; contrast exergonic and endergonic reactions (DOK 2)
- Explain what must happen for two molecules to react (DOK 2)
- Describe ways to state the rate of a chemical reaction (DOK 2)
- Describe ways to manipulate the rate of chemical reactions (DOK 2)

Core Activities and Corresponding Instructional Methods:

- Atomic Trading Cards (Chapter 18, Lab 1)
- Strength of Attractions: Ions v. Molecules (Chapter 18, Lab 2 A or B)
- Glow or Not to Glow (Chapter 19, Lab 1)
- Reading Essentials (online resource)-Interactive Instruction
- Foldables (from textbook)-Indirect Instruction
- Science Notebook (online resource)-Indirect Instruction

Assessments (Including but not limited to):

Diagnostic:

- Pre-test (designed by teacher)
- Graphic organizers
    - KWL

charts Formative:

- Observations
- White boards
- Oral responses
- Foldables (from textbook)

- Launch Lab (from textbook)
- Reading Check questions (from textbook)
- Mini Lab (from textbook)
- Section Review (from textbook)
- Daily Intervention (from teacher textbook)
- Assessment Portfolio (from teacher textbook)
- Lab Reports (from textbook / online resources)
- Directed Reading (online resources)
- Vocabulary eGames (online resources)

Summative:

- Glencoe Physical Science e-Assessment (online resources)
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- Chapter Tests A, B, and C (online resources)
- Assessment Transparency (online resources)
- Mastering Standardized Test (online resources)
- Section Review (from textbook)
- Unit 4 STEM Project (from textbook)
- Unit 5 STEM Project (from textbook)
- Lab Reports (from textbook and online resources)
- Chapter Review (from textbook)

Extensions:

- Section Focus Visual and Worksheet (online resources)

  Enrichment

  MiniLab Worksheet

  Online Section Quizzes (English/Spanish)

- Additional lab activities

  Carbon Allotropes (Chapter 17, Lab 2 A or

  B) Reaction Rates (Chapter 19, lab 2 A or B)

Correctives:

- Science Notebook (online resources)
- Reading Essentials (online resources)
- Section Focus Visual and Worksheet (online resources)

    Directed Reading for Content Mastery (English/Spanish)

    Reinforcement

- Additional lab activities

    Metals and Nonmetals (Chapter 17, Lab 1)

Materials and Resources:

Primary Textbook- Glencoe Physical Science, McGraw-Hill Education, 2017 Unit 4 Chapter 17: Elements and Their Properties

Primary Textbook- Glencoe Physical Science, McGraw-Hill Education, 2017 Unit 5 Chapter 18: Chemical Bonds

Chapter 19: Chemical Reactions Glencoe

Physical Science Section Review Glencoe

Physical Science Science Notebook Glencoe

Physical Science Reading Essentials Glencoe

Physical Science e Assessment

Primary Textbook(s) Used for this Course of Instruction

Name of Textbook: Physical Science

Textbook ISBN #: 978-0-07-677458-

9

Textbook Publisher & Year of Publication: McGraw-Hill Education, 2017

Curriculum Textbook is utilized in (title of course): Applications of Physical Science

Checklist to Complete and Submit:

(Scan and email)

_____ Copy of the curriculum using the template entitled "Planned Instruction," available on the district website.

_____ The primary textbook form(s).

_____ The appropriate payment form, in compliance with the maximum curriculum writing hours noted on the first page of this document.

Each principal and/or department chair has a schedule of "First and Second Reviewers." Each Reviewer must sign & date below.

First Reviewer Printed Name_____

First Reviewer Signature_____Date_____

Second Reviewer Printed Name_____

Second Reviewer Signature_____Date_____

Appendix:
Standards

Unit 1:

Standards Aligned System:

3.2.P.B1- Differentiate among translational motion, simple harmonic motion, and rotational motion in terms of position, velocity, and acceleration. Use force and mass to explain translational motion or simple harmonic motion of objects.
Relate torque and rotational inertia to explain rotational motion.

3.2.P.B6-Use Newton's laws of motion and gravitation to describe and predict the motion of objects ranging from atoms to the galaxies.

3.2.12.B6- Compare and contrast motions of objects using forces and conservation laws.

3.2.12.B4-Describe conceptually the attractive and repulsive forces between objects relative to their charges and the distance between them.

PA Common Core Reading and Writing Standards for Science:

CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CC.3.5.9-10.B. Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

CC.3.5.9-10.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

CC.3.5.9-10.E. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, and energy).
CC.3.5.9-10.F. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

CC.3.5.9-10.G. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

CC.3.5.9-10.H. Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

CC.3.5.9-10.I. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

CC.3.5.9-10.J. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

CC.3.6.9-10.A. Write arguments focused on discipline-specific content.
- Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
- Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from or supports the argument presented.

CC.3.6.9-10.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

• Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
• Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
• Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
• Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
• Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
• Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

CC.3.6.9-10.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CC.3.6.9-10.D. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

CC.3.6.9-10.E. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

CC.3.6.9-10.F. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CC.3.6.9-10.G. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

CC.3.6.9-10.H. Draw evidence from informational texts to support analysis, reflection, and research.

CC.3.6.9-10.I. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 2:

Standards Aligned System:

3.2.P.B2-Explain the translation and simple harmonic motion of objects using conservation of energy and conservation of momentum. Describe the rotational motion of objects using the conservation of energy and conservation of angular momentum. Explain how gravitational, electrical, and magnetic forces and torques give rise to rotational motion.

3.2.P.B6-Use Newton's laws of motion and gravitation to describe and predict the motion of objects ranging from atoms to the galaxies.

3.2.12.B2- Explain how energy flowing through an open system can be lost. Demonstrate how the law of conservation of momentum and conservation of energy provide alternate approaches to predict and describe the motion of objects.

3.2.12.B6- Compare and contrast motions of objects using forces and conservation laws.

PA Common Core Reading and Writing Standards for Science:

CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CC.3.5.9-10.B. Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

CC.3.5.9-10.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

CC.3.5.9-10.E. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, and energy).

CC.3.5.9-10.F. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

CC.3.5.9-10.G. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

CC.3.5.9-10.H. Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

CC.3.5.9-10.I. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

CC.3.5.9-10.J. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

CC.3.6.9-10.A. Write arguments focused on discipline-specific content.
- Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
- Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

• Provide a concluding statement or section that follows from or supports the argument presented.

CC.3.6.9-10.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
• Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
• Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
• Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
• Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
• Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
• Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

CC.3.6.9-10.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CC.3.6.9-10.D. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

CC.3.6.9-10.E. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

CC.3.6.9-10.F. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CC.3.6.9-10.G. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering

the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

CC.3.6.9-10.H. Draw evidence from informational texts to support analysis, reflection, and research.

CC.3.6.9-10.I. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 3:

Standards Aligned System:

3.2.C.A1-Differentiate between physical properties and chemical properties.
Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures. Explain the relationship of an element's position on the periodic table to its atomic number, ionization energy, electro-negativity, atomic size, and classification of elements. Use electronegativity to explain the difference between polar and nonpolar covalent bond

3.2.C.A5-Recognize discoveries from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus), and Bohr (planetary model of atom), and understand how each discovery leads to modern theory. Describe Rutherford's "gold foil" experiment that led to the discovery of the nuclear atom. Identify the major components (protons, neutrons, and electrons) of the nuclear atom and explain how they interact.

3.2.12.A2- Distinguish among the isotopic forms of elements.
Explain the probabilistic nature of radioactive decay based on subatomic rearrangement in the atomic nucleus. Explain how light is absorbed or emitted by electron orbital transitions.

3.2.1.C.A2-Compare the electron configurations for the first twenty elements of the periodic table. Relate the position of an element on the periodic table to its electron configuration and compare its reactivity to the reactivity of other elements in the table. Explain how atoms combine to form compounds through both ionic and covalent bonding. Predict chemical formulas based on the number of valence electrons. Draw Lewis dot structures for simple molecules and ionic compounds. Predict the chemical formulas for simple ionic and molecular

compounds. Use the mole concept to determine number of particles and molar mass for elements and compounds. Determine percent composition, empirical formulas, and molecular formulas.

3.2.10.A4-Describe chemical reactions in terms of atomic rearrangement and/or electron transfer.Predict the amounts of products and reactants in a chemical reaction using mole relationships.Explain the difference between endothermic and exothermic reactions.Identify the factors that affect the rates of reactions.

3.4.10.A-Illustrate how the development of technologies is often driven by profit and an economic market. Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function.

3.2.10.A1-Predict properties of elements using trends of the periodic table. Identify properties of matter that depend on sample size.Explain the unique properties of water (polarity, high boiling point, forms hydrogen bonds, high specific heat) that support life on Earth.

3.2.10.A5-Apply the mole concept to determine number of particles and molar mass for elements and compounds.

3.2.C.A4- Predict how combinations of substances can result in physical and/or chemical Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions. Balance chemical equations by applying the laws of conservation of mass. Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion. Use stoichiometry to predict quantitative relationships in a chemical reaction.

3.2.12.A1- Compare and contrast colligative properties of mixtures.Compare and contrast the unique properties of water to other liquids.

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CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CC.3.5.9-10.B. Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

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CC.3.5.9-10.F. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

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appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CC.3.6.9-10.G. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

CC.3.6.9-10.H. Draw evidence from informational texts to support analysis, reflection, and research.

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Unit 4:

Standards Aligned System:

3.2.C.A1
Differentiate between physical properties and chemical properties. Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures. Explain the relationship of an element's position on the periodic table to its atomic number, ionization energy, electro-negativity, atomic size, and classification of elements. Use electronegativity to explain the difference between polar and nonpolar covalent bonds.

3.2.C.A2 -Compare the electron configurations for the first twenty elements of the periodic table. Relate the position of an element on the periodic table to its electron configuration and compare its reactivity to the reactivity of other elements in the table. Explain how atoms combine to form compounds through both ionic and covalent bonding. Predict chemical formulas based on the number of valence electrons. Draw Lewis dot structures for simple molecules and ionic compounds. Predict the chemical formulas for simple ionic and molecular compounds. Use the mole concept to determine number of particles and molar mass for elements and compounds. Determine percent composition, empirical formulas, and molecular formulas.

3.2.C.A3 - Describe the three normal states of matter in terms of energy, particle motion, and phase transitions. Identify the three main types of radioactive decay and compare their

properties. Describe the process of radioactive decay by using nuclear equations and explain the concept of half-life for an isotope. Compare and contrast nuclear fission and nuclear fusion.

3.2.C.A4 - Predict how combinations of substances can result in physical and/or chemical changes. Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions. Balance chemical equations by applying the laws of conservation of mass. Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion. Use stoichiometry to predict quantitative relationships in a chemical reaction.

3.2.C.A5 - Recognize discoveries from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus), and Bohr (planetary model of atom), and understand how each discovery leads to modern theory. Describe Rutherford's "gold foil" experiment that led to the discovery of the nuclear atom. Identify the major components (protons, neutrons, and electrons) of the nuclear atom and explain how they interact.

3.2.10.A1 - Predict properties of elements using trends of the periodic table.Identify properties of matter that depend on sample size. Explain the unique properties of water (polarity, high boiling point, forms hydrogen bonds, high specific heat) that support life on Earth.

3.2.10.A4 -Describe chemical reactions in terms of atomic rearrangement and/or electron transfer. Predict the amounts of products and reactants in a chemical reaction using mole relationships. Explain the difference between endothermic and exothermic reactions. Identify the factors that affect the rates of reactions.

3.2.10.A5 - Describe the historical development of models of the atom and how they contributed to modern atomic theory. Apply the mole concept to determine number of particles and molar mass for elements and compounds.

3.2.12.A1 - Compare and contrast colligative properties of mixtures.Compare and contrast the unique properties of water to other liquids.

3.2.12.A2 - Distinguish among the isotopic forms of elements. Explain the probabilistic nature of radioactive decay based on subatomic rearrangement in the atomic nucleus. Explain how light is absorbed or emitted by electron orbital transitions.

3.2.12.A5 - Use VSEPR theory to predict the molecular geometry of simple molecules. Predict the shift in equilibrium when a system is subjected to a stress.

PA Common Core Reading and Writing Standards for Science:

CC.3.5.9-10.A. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CC.3.5.9-10.B. Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

CC.3.5.9-10.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

CC.3.5.9-10.E. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, and energy).

CC.3.5.9-10.F. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

CC.3.5.9-10.G. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

CC.3.5.9-10.H. Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

CC.3.5.9-10.I. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

CC.3.5.9-10.J. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

CC.3.6.9-10.A. Write arguments focused on discipline-specific content.

- Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
- Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from or supports the argument presented.

CC.3.6.9-10.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

- Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

CC.3.6.9-10.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CC.3.6.9-10.D. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

CC.3.6.9-10.E. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

CC.3.6.9-10.F. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CC.3.6.9-10.G. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

CC.3.6.9-10.H. Draw evidence from informational texts to support analysis, reflection, and research.

CC.3.6.9-10.I. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.