DELAWARE VALLEY SCHOOL DISTRICT

PLANNED INSTRUCTION

A PLANNED COURSE FOR:

_____8th Grade Honors Science_____

Grade Level: 8

Date of Board Approval: _____2019_____

DELAWARE VALLEY SCHOOL DISTRICT

Planned Instruction

Title of Planned Instruction: 8th Grade Honors Science

Subject Area: Honors Physical Science Grade(s): 8th

Course Description: 8th grade Honors Science is a course that covers concepts in scientific thinking and problem solving, Physical Science, and Chemical Science. Each concept that is covered in this course is taught for mastery. The intent of this curriculum is to provide all 8th grade honors students with a sound and firm foundations in its topics to better prepare our students to master the concepts that will be presented to them on their 8th grade PSSA Science exam as well as in their higher level Science courses, in which they will be working towards the goal of achieving successful scores on Advanced Placement Science exams.

Time/Credit for the Course: Full Year

Curriculum Writing Committee: Mark Alderfer, Alyssa Tomaskovic

Curriculum Map

1. **Marking Period One:**

   - **Overview based on 45 days:** Students will gain an understanding of what science is, how to approach a scientific problem, employ scientific inquiry before applying those foundations to the topics of motion and forces. Students will learn how to identify when motion occurs and how to describe the relationship between motion and an applied force.

   - **Time Range:** 40-45 days

   - **Unit One: Foundations of Science**
     i. **Chapter One: Scientific Thinking and Experimental Design**
   - **Unit Two: Foundations of Motion**
     i. **Chapter Eleven: Motion**
     ii. **Chapter Twelve: Forces and Motion**

   - **Goals:**
     Understanding of:
     i. **What is Science? (4 days)**
     ii. **Using a Scientific Approach (2 days)**
     iii. **Measurement (3 days)**
     iv. **Presenting Scientific Data (3 days)**
     v. **Distance and Displacement (4 days)**
     vi. **Speed and Velocity (4 days)**
     vii. **Acceleration (3 days)**
     viii. **Forces (4 days)**
     ix. **Newton's First and Second Laws of Motion (2 days)**
     x. **Newton's Third Law of Motion (2 days)**
     xi. **Universal Forces (2 days)**
     xii. **Assessment, In-Class Enrichment/Extension, Laboratory Exploration and Review (7-12 days)**

2. **Marking Period Two:**

   - **Overview based on 45 days:** Students will extend their knowledge of forces to include how forces are impacted in a fluid medium. Students will then learn about what energy is, its various forms, and explore methods of heat transfer in relation to the environment.

   - **Time Range:** 40-45 Days

- **Unit Three: Forces in fluids, energy, and heat**
    i. **Chapter Thirteen: Forces in Fluids**
    ii. **Chapter Fifteen: Energy**
    iii. **Chapter Sixteen: Heat**

- **Goals:**
  Understanding of:
    i. **Fluid Pressure (3 days)**
    ii. **Forces and pressure in Fluids (3 days)**
    iii. **Buoyancy (3 days)**
    iv. **Energy and Its Forms (5 days)**
    v. **Energy Conversion and Conservation (4 days)**
    vi. **Energy Resources (2 days)**
    vii. **Thermal Energy and Matter (2 days)**
    viii. **Heat and Thermodynamics (3 days)**
    ix. **Using Heat (3 days)**
    x. **Assessment, In-Class Enrichment/Extension, Laboratory Exploration and Review (7-12 days)**

3. **Marking Period Three:**

- **Overview based on 45 days:** Students will gain an understanding of what work and power are, eventually being able to describe the relationship between the two. They will then learn about the six simple machines before learning about how to classify matter and identify the various states of matter. Students will gain an understanding of how to identify phase changes.

- **Time Range:** 40-45 days

- **Unit Four: Work, Power, Simple Machines**
    i. **Chapter Fourteen: Work, Power, Simple Machines**
- **Unit Five: Classification of Matters**
    i. **Chapter Two: Properties of Matter**
    ii. **Chapter Three: States of Matter**

- **Goals:**
  Understanding of:
    i. **Work and Power (3 days)**
    ii. **Work and Machines (3 days)**
    iii. **Mechanical Advantage and Efficiency (2 days)**
    iv. **Simple Machines (6 days)**
    v. **Classification of Matter (4 days)**
    vi. **Physical Properties (3 days)**

vii. **Chemical Properties (3 days)**
viii. **Solids, Liquids and Gasses (3 days)**
ix. **The Gas Laws (3 days)**
x. **Phase Changes (3 days)**
xi. **Assessment, In-Class Enrichment/Extension, Laboratory Exploration and Review (7-12 days)**

4. **Marking Period Four:**

- **Overview based on 45 days:** Students will gain an understanding of the concepts of the structure and parts of the atom. Students will gain and understanding of the nomenclature used for the identification of atoms. Students will gain an understanding of the periodic table of elements. Students will conclude the marking period by gaining and understanding of chemical bonds and reactions.

- **Time Range:** 40-45 days

- **Unit Six: Atomic Structure**
  i. **Chapter Four: Atomic Structure**
  ii. **Chapter Five: Periodic Table**
- **Unit Seven: Chemical Interactions**
  i. **Chapter Six: Chemical Bonds**
  ii. **Chapter Seven: Chemical Reactions**

- **Goals:**
  Understanding of:
  i. **Studying Atoms (3 days)**
  ii. **The Structure of the Atom (2 days)**
  iii. **Modern Atomic Theory (2 days)**
  iv. **Organizing the Elements (3 days)**
  v. **The Modern Periodic Table (3 days)**
  vi. **Representative Groups (2 days)**
  vii. **Ionic Bonding (2 days)**
  viii. **Covalent Bonding (2 days)**
  ix. **Naming Compounds and Writing Formulas (3 days)**
  x. **The structure of Metals (2 days)**
  xi. **Describing Reactions (2 days)**
  xii. **Types of reactions (2 days)**
  xiii. **Energy Changes in Reactions (2 days)**
  xiv. **Reaction Rates (2 days)**
  xv. **Equilibrium (2 days)**
  xvi. **Assessment, In-Class Enrichment/Extension, Laboratory Exploration and Review (7-12 days)**

Curriculum Plan

Unit: 1: Foundations of Science (Ch 1) **Marking Period:** 1

Standard(s): 3.1.8.A9, 3.1.8.B6, 3.1.8.C4, 3.2.8.A6, 3.2.8.B7, 3.3.8.A8, 3.3.8.D3, 3.1.B.A9, 3.1.B.B6, 3.1.B.C4, 3.2.B.A6, 3.2.B.B7, 3.3.B.A8, 3.3.B.D3, 3.1.C.A9, 3.1.C.B6, 3.1.C.C4, 3.2.C.A6, 3.2.C.B7, 3.3.C.A8, 3.3.C.D3, 3.1.P.A9, 3.1.P.B6
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Anchor(s): S8.A.1.1, S8.A.2.1, S8.A.2.2, S8.A.3.2, S.8.C.3, S.8.C.1.1.1, S.8.C.1.1.2
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Big Idea #1: Basic Principles and Applications of Physics and Chemistry

Essential Questions:

- What are the main ideas of chemistry and physics?
- How do these disciplines overlap?
- How are these sciences related to technology?
- What are the necessary skills utilized by these scientists?
- What is the difference between a theory and a law?

Concepts:

- Scientific theories are well tested conclusions that attempt to answer a specific scientific question that still have some flaws.
- Scientific laws are scientific conclusions or answers to scientific questions that are tested many times by many different scientists and are proven or strongly supported to be true.
- The basic steps in the scientific method are:
    - Ask a question
    - Gather information from research
    - Form a hypothesis
    - Perform an experiment
    - Record and analyze data
    - Form a conclusion

There are three types of variables in a scientific experiment:

- Controlled variables
- Independent variables
- Dependent variables

There are two different types of data that a scientist can collect, record and Analyze that should be objective and meaningful:

- Qualitative Data
- Quantitative Data

Competencies: As a result of this unit of instruction, students will be able to:

- Discuss the scientific problem solving model in an informed manner with other students and teachers.
- Attempt to answer a self-generated, scientific, testable question in a hands on setting
- Master all key vocabulary terms associated with this unit of instruction
- Successfully identify all types of variables in many different examples of scientific experiments
- Successfully be able to integrate pertinent mathematics concepts into their data recording and analysis (graphing, charting, averaging)
- Successfully be able to identify the two different types of data that can be produced by a scientific experiment
- Increase the ability to think critically through problems both inside and outside of the Science classroom
- Make meaningful observations that are free from opinion
- Make inferences based on data and scientific information
- Formulate well thought out conclusions following scientific experiments
- Identify experimental flaws and provide solutions to those flaws
- Distinguish between Physics, Chemistry, Earth and Space Science and describe how they overlap.

Overview: This unit is designed to inform students that scientific thinking skills are very useful both inside and outside of their Science classroom. Students will master the steps involved in the process of solving valid testable questions in a methodical way, learn to interpret their results and data, and use those interpretations to correct experimental flaws, draw conclusions and make inferences about the world around them. This unit focuses on reviewing and expanding on student knowledge concerning atomic structure, basic knowledge of matter and properties of elements so as to prepare students for the next unit of study that focuses on foundational concepts of physics, including motion and forces that drive life as we know it.

Goals:

- For students to build a solid body of knowledge about scientific thinking skills, experimental design and data analysis
- For students to become better critical thinkers and problem solvers
- For students to better understand what science is and why it is important
- For students to better understand the areas of Physics, Chemistry, Earth and Space Science and how they overlap
- For students to build a solid body of knowledge about the laws that govern space, time, forces, motion, matter and energy and their interactions.

- For students to be able to apply those principals of physics to everyday, real world situations in a way that is meaningful and helpful to their lives.
- For students to form a solid foundation of basic principles of physics

Objectives:

- Discuss the scientific problem solving model in an informed manner with other students and teachers (DOK Level 3).
- Create an experimental scenario that answers a self-generated, scientific, testable question in a hands on setting (DOK level 4)
- Master all key vocabulary terms associated with this unit of instruction (DOK level 2)
- Successfully identify all types of variables in many different examples of scientific experiments (DOK level 1)
- Successfully be able to integrate pertinent mathematics concepts into their data recording and analysis (graphing, charting, averaging) (DOK level 4)
- Successfully be able to identify the two different types of data that can be produced by a scientific experiment (DOK level 1)
- Increase the ability to think critically through problems both inside and outside of the Science classroom (DOK level 4)
- Make meaningful observations that are free from opinion (DOK level 3)
- Make inferences based on data and scientific information (DOK level 2)
- Formulate well thought out conclusions following scientific experiments (DOK level 3)
- Identify experimental flaws and provide solutions to those flaws (DOK level 1)
- Distinguish between Physics, Chemistry, Earth and Space Science and describe how they overlap (DOK level 1)

Core Activities and Corresponding Instructional Methods:

1. For each chapter included in this unit of study, the teacher should present all pertinent information found under the concepts section of this unit in a way that aid in not only retention, but mastery of all key concepts and mandatory vocabulary for this unit of instruction. Some suggested means of presenting this information are PowerPoint notes, cloze notes format, skeleton outlines, and student generated notes that are taken during a teacher presentation.

2. Give students a sample of a scientific experiment and have them identify the controlled, independent and dependent variables as well as experimental flaws.

3. Lead a class discussion that prompts students to compare and contrast different known hypotheses, scientific theories and laws based on their knowledge of those terms.

4. Have students work through a graded laboratory experiment, beginning with a testable question and working through the steps in the scientific method to conclusion where they have to produce a summary of their experiment.

5. Present all unit vocabulary to students in a format that they can study for retention and application of knowledge. See appendix for the MANDATORY list of vocabulary words.

6. Create an assignment where students will design and produce a body of work to exemplify a complete understanding of the scientific method though process and all of its steps, ability to design an experiment from scratch to test a scientific question and ability to critique and analyze conclusions in order to either obtain an answer to the original scientific question or revise the thought process in order to attempt to achieve an acceptable answer to that question.

7. Suggested STEAM incorporation of the teacher should assign groups a different branch of science and have students research various problems that their particular branch can address to increase understanding of different scientific disciplines.

8. Suggested activity for understanding science can include students completing activities regarding reliability of information found online and on social media

Assessments:

- **Diagnostic:**
  - Pretests
  - Ungraded homework
  - Class Discussions
  - Teachers observations
- **Formative:**
  - Quizzes
  - Assignments
  - Graded Homework Assignments
  - Practice Tests
  - Laboratory Exploration
  - PSSA Aligned Short Open Ended Questions
- **Summative:**
  - Unit Tests
  - Major Projects

Extensions: Optional recommended Inquiry Labs and Digital Path interactive multimedia practice opportunities. Have students write their own experiments, one with the correct steps

and components of the scientific method, the other without. Students can then exchange papers to identify which experiment is the correct one and articulate their reasoning. Students can research STEM-based current event article on reputable news website. They can write a summary of the article and a paragraph explaining the overarching significance/why should we care.

Correctives:

- Give students extra practice identifying variables in an experiment.
- Re-teach and retest important concepts including mandatory vocabulary.
- Provide additional remediation opportunities for math applications.

Materials and Resources: See last page of curriculum

Curriculum Plan

Unit: 2: Foundations of Motion (Ch 11 and 12) **Marking Period:** 1

Standard(s): 3.2.5.B1, 3.2.6.B1, 3.2.7.B1
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Anchor(s): S8.A3.2, S8.C.3.1.1, S8.C.3.1.1, S8.A.2.1, S8.A.2.2, S8.A.1.1,
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Big Idea #1: A change in the direction of an object is known as motion, and motion is governed by certain principles.

Essential Questions:

- What is needed to describe motion completely?
- How are distance and displacement different?
- How do you add displacements?
- How are instantaneous speed and average speed different?
- How can you find the speed from a distance time graph?
- How are speed and velocity different?
- How do velocities add?
- How are changes in velocity described?
- How can you calculate acceleration?
- What is instantaneous acceleration?
- How does a speed time graph represent acceleration?

Concepts:

- Frame of reference
- Measuring distance
- Measuring displacements
- Speed calculations
- Graphing motion
- Velocity and combining velocities
- Defining acceleration
- Changes in speed and direction
- Calculating acceleration
- Graphs of accelerated motion
- Distance time graphs

Competencies: As a result of this unit of instruction, students will be able to:

- Identify frames of reference and describe how they are used to measure motion
- Identify appropriate SI units for measuring distances
- Distinguish between distance and displacement

- Calculate displacement using vector addition
- Identify appropriate SI units for measuring speed
- Compare and contrast instantaneous speed and average speed
- Interpret distance time graphs
- Calculate the speed of an object using slopes
- Describe how velocities combine
- Identify changes in motion that produce acceleration
- Describe examples of constant acceleration
- Calculate the acceleration of an object
- Interpret speed time and distance time graphs
- Classify acceleration as positive or negative
- Describe instantaneous acceleration

Big Idea #2: All changes in motion are caused by the forces that act on objects.

Essential Questions:

- How do forces affect the motion of an object?
- What are the four main types of friction?
- How do gravity and air resistance affect a falling object?
- In what direction does Earth's gravity act?
- Why does a projectile follow a curved path?
- How does Newton's first law relate change in motion to a zero net force?
- How does Newton's second law relate force, mass and acceleration?
- How are weight and mass related?
- What is Newton's third law of motion?
- What is needed for an object to have a large momentum?
- How is momentum conserved?
- What force can attract and repel?
- What force holds the nucleus together?
- What is Newton's law of universal gravitation?

Concepts:

- Measuring and units of force
- Defining force
- Combining forces
- Balancing forces
- Frictional forces
- Gravity
- Calculating acceleration
- Projectile motion
- Aristotle, Galileo and Newton
- Newton's Laws of Motion
- Momentum

- Conservation of momentum
- Electromagnetic forces
- Nuclear forces
- Gravitational force
- Orbits

Competencies: After this unit of instruction, the students will be able to:

- Describe examples of force
- Identify appropriate SI units used to measure force
- Explain how the motion of an object is affected when balanced and unbalanced forces are acting on it
- Compare and contrast the four kinds of friction
- Describe how Earth's gravity and air resistance affect falling objects
- Describe the path of a projectile
- Identify the forces that produce projectile motion
- Describe Newton's first law of motion and how it relates to inertia
- Describe Newton's second law of motion and use it to calculate acceleration, force and mass
- Relate the mass of an object to its weight
- Explain how action and reaction forces are related according to Newton' s third law of motion
- Calculate the momentum of an object and describe what happens when momentum is conserved during a collision
- Identify the forms of electromagnetic force that can both attract and repel
- Identify and describe the universal forces acting within the nucleus
- Define Newton's law of universal gravitation and describe the factors affecting gravitational force
- Describe centripetal force and the type of motion it produces

Overview: This unit is designed to provide students with a solid background in the laws that govern space, time, forces, motion, matter, and energy. This is foundational basis will provide a platform for students to then apply additional and extensive ideas regarding forces, energy, and work, power, and simple machines.

Goals:

- For students to build a solid body of knowledge about the laws that govern space, time, forces, motion, matter and energy and their interactions.
- For students to be able to apply those principals of physics to everyday, real world situations in a way that is meaningful and helpful to their lives.
- For students to explore careers in the various scientific disciplines.

Objectives:

- Identify frames of reference and describe how they are used to measure motion (DOK: Level 1)
- Identify appropriate SI units for measuring distances (DOK: Level 1)
- Distinguish between distance and displacement (DOK: Level 2)
- Calculate displacement using vector addition (DOK: Level 2)
- Identify appropriate SI units for measuring speed (DOK: Level 1)
- Compare and contrast instantaneous speed and average speed (DOK: Level 2)
- Interpret distance time graphs (DOK: Level 2)
- Calculate the speed of an object using slopes (DOK: Level 2)
- Describe how velocities combine (DOK: Level 1)
- Identify changes in motion that produce acceleration (DOK: Level 1)
- Describe examples of constant acceleration (DOK: Level 1)
- Calculate the acceleration of an object (DOK: Level 2)
- Interpret speed time and distance time graphs (DOK: Level 2)
- Classify acceleration as positive or negative (DOK: Level 2)
- Describe instantaneous acceleration (DOK: Level 1)
- Describe examples of force (DOK: Level 1)
- Identify appropriate SI units used to measure force (DOK: Level 1)
- Explain how the motion of an object is affected when balanced and unbalanced forces are acting on it (DOK: Level 1)
- Compare and contrast the four kinds of friction (DOK: Level 2)
- Describe how Earth's gravity and air resistance affect falling objects (DOK: Level 1 & 2)
- Describe the path of a projectile (DOK: Level 2)
- Identify the forces that produce projectile motion (DOK: Level 1)
- Describe Newton's first law of motion and how it relates to inertia (DOK: Level 1 & 2)
- Describe Newton's second law of motion and use it to calculate acceleration, force and mass (DOK: Level 1 & 2)

Core Activities and Corresponding Instructional Methods:

1. For each chapter included in this unit of study, the teacher should present all pertinent information found under the concepts section of this unit in a way that aid in not only retention, but mastery of all key concepts and mandatory vocabulary for this unit of instruction. Some suggested means of presenting this information are PowerPoint notes, cloze notes format, skeleton outlines, and student generated notes that are taken during a teacher presentation.

2. The teacher should design a hands on application or laboratory exploration for each of the chapters in this until to further emphasize and connect the different segments and layers of learning the overarching processes discussed. Many examples of these types of activities are found in the resource material that comes with the primary textbook for this course.

3. The teacher should assign a formal lab report to be written and graded for one of the laboratory exploration or hands on activities in this unit to increase writing across the curriculum.

4. Suggested lab prior to beginning unit as an exploratory application includes rolling marbles to determine how the variables of speed, distance, and time are related.

5. Additional suggested lab activities on distance and displacement can include having students walk certain distances and calculating the displacement associated with it.

6. STEAM activity can include creating a poster that displays how the four types of friction are present in a student selected sport, hobby, or activity.

7. Present all unit vocabulary to students in a format that they can study for retention and application of knowledge. See appendix for the MANDATORY list of vocabulary words.

Assessments:

- **Diagnostic:**
  - Pretests
  - Ungraded homework
  - Class Discussions
  - Teachers observations
- **Formative:**
  - Quizzes
  - Assignments
  - Graded Homework Assignments
  - Practice Tests
  - Laboratory Exploration
  - PSSA Aligned Short Open Ended Questions
- **Summative:**
  - Unit Tests
  - Major Projects

Extensions: Optional recommended Inquiry Labs and Digital Path interactive multimedia practice opportunities. Have the students select from a list of potential project ideas (write a

song, create a lesson, etc) and create a visual or auditory means of describing the three laws of motion. Students can research STEM-based current event article on reputable news website. They can write a summary of the article and a paragraph explaining the overarching significance/why should we care

Correctives:

- Re-teach and retest important concepts including mandatory vocabulary.
- Provide additional remediation opportunities for math applications.

Materials and Resources: See last page of curriculum

Curriculum Plan

Unit: 3: Forces in Fluids, Energy, and Heat (Ch 13, 15, 16) **Marking Period:** 2

Standard(s): 3.2.7.B3, 3.2.6.B3, 3.2.6.B6, 3.2.5.B3, 3.2.7.B6, 3.2.6.A1, 3.2.10.A3
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Anchor(s): S8.A.3.2, S8.C.2.1.2, S8.A.2.1, S8.A.2.2, S8.C.2.1.3
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Big Idea #1: Forces acting on fluids cause different events to occur than forces acting on non-fluids.

Essential Questions:

- How is pressure calculated?
- How does water pressure change with depth?
- How is pressure distributed at a given level in a fluid?
- How does air pressure change with altitude?
- How does Pascal's principal describe the transmission of pressure through a fluid?
- How does a hydraulic system work?
- How is the speed of a fluid related to the pressure within the fluid?
- What is the effect of buoyancy on the apparent weight of an object?
- How can you determine if an object will float or sink in a fluid?

Concepts:

- Calculating pressure in fluid
- Air pressure and the atmosphere
- Transmitting pressure in a fluid
- Pascal's Principal
- Hydraulic systems
- Bernoulli's Principal
- Buoyant force
- Archimedes' Principal
- Density and its effect on buoyancy

Competencies: After this unit of instruction, the students will be able to:

- Define and calculate pressure
- Identify appropriate SI units for measuring pressure
- Describe the relationship between water depth and the pressure it exerts
- Describe how forces from pressure are distributed at a given level in a fluid
- Explain how altitude affects air pressure
- Describe how pressure is transmitted in a fluid according to Pascal's Principal

- Explain how a hydraulic system works to change a force
- Explain how the speed and pressure of a fluid are related according to Pascal's principal
- Explain the effect of buoyancy on the apparent weight of an object
- Explain the relationship between the volume of fluid displaced by an object and buoyant force acting on an object according to Archimedes' principal
- Describe the relationship among object weight, buoyant force, and whether an object sinks or floats in a fluid

Big Idea #2: Energy is continuously converted between many different forms.

Essential Questions:

- How are energy and work related?
- What factors does the kinetic energy of an object depend on?
- How is gravitational potential energy determined?
- What are the major forms of energy?
- Can energy be converted from one form to another?
- What is the law of conservation of energy?
- What energy conversion takes place as an object falls towards Earth?
- How are energy and mass related?

Concepts:

- Energy and work
- Kinetic energy
- Potential energy
- Forms of energy
- Conservation of energy
- Energy conversion
- Energy related to mass

Competencies: After this unit of instruction, the students will be able to:

- Describe the relationship between work and energy
- Relate kinetic energy to mass and speed and calculate these quantities
- Analyze how potential energy is related to an objects position and give examples of gravitational potential and elastic potential energy
- Solve equations that relate an object's gravitational potential energy to its mass and height
- Give examples of the major forms of energy and explain how each is produced
- Describe conversions of energy from one form to another
- State and apply the law of conservation of energy
- Analyze how energy is conserved in conversions between kinetic energy and potential energy and solve equations that equate initial energy to final energy
- Describe the relationship between energy and mass and calculate how much energy is equivalent to a given mass

Big Idea #3:

Essential Questions:

- How are heat transfer and work related?
- How does heat flow from one object to another?
- What does the thermal energy of an object depend on?
- How does thermal expansion occur?
- What are the mechanisms of heat transfer?

Concepts:

- Spontaneous flow of heat
- Temperature
- Thermal energy
- Thermal expansion and contraction
- Specific heat
- Conduction
- Insulators
- Conductors
- Convection
- Radiation
- 3 Laws of Thermodynamics
- Heat engines

Competencies: After this unit of instruction, students will be able to:

- Describe how heat is transferred from one object to another.
- Identify the variables that the thermal energy of an object depends on.
- Compare and contrast temperature and thermal energy.
- Define under what conditions thermal expansion and contraction occurs.
- Compare and contrast the three mechanisms of heat transfer.
- Identify and apply the three laws of thermodynamics
- Describe uses for various heat engines.

Overview: Students will be able to compare the various forces acting on the objects around them. Students will then relate this idea to energy and how energy is transferred or transformed, not created or destroyed. They will then explore how heat is transferred from one object to another.

Goals:

- For students to build a solid body of knowledge about forces in fluids, including liquids and air, and apply those big ideas to practical, real world situations.
- For students to relate the transfer of energy to happenings they see around them on a regular basis.

- For students to gain an increased understanding of how the principles of heat transfer are applied to heat engines found in common objects like cars, refrigerators, and air conditioners.

Objectives:

- Define and calculate pressure (DOK: Levels 1 & 2)
- Identify appropriate SI units for measuring pressure (DOK: Level 1)
- Describe the relationship between water depth and the pressure it exerts (DOK: Level 2)
- Describe how forces from pressure are distributed at a given level in a fluid (DOK: Level 2)
- Explain how altitude affects air pressure (DOK: Level 2)
- Describe how pressure is transmitted in a fluid according to Pascal's Principal (DOK: Level 2)
- Explain how a hydraulic system works to change a force (DOK: Level 1)
- Explain how the speed and pressure of a fluid are related according to Pascal's principal (DOK: Level 1)
- Explain the effect of buoyancy on the apparent weight of an object (DOK: Level 2)
- Explain the relationship between the volume of fluid displaced by an object and buoyant force acting on an object according to Archimedes' principal (DOK: Level 2)
- Describe the relationship among object weight, buoyant force, and whether an object sinks or floats in a fluid (DOK: Level 2)
- Relate kinetic energy to mass and speed and calculate these quantities (DOK: Level 2)
- Analyze how potential energy is related to an objects position and give examples of gravitational potential and elastic potential energy (DOK: Level 4)
- Solve equations that relate an object's gravitational potential energy to its mass and height (DOK: Level 2)
- Give examples of the major forms of energy and explain how each is produced (DOK: Level 1)
- Describe conversions of energy from one form to another (DOK: Level 1)
- State and apply the law of conservation of energy (DOK: Level 1 & 4)
- Analyze how energy is conserved in conversions between kinetic energy and potential energy and solve equations that equate initial energy to final energy (DOK: Level 4)
- Describe the relationship between energy and mass and calculate how much energy is equivalent to a given mass (DOK: Level 1 & 2)
- Describe the relationship between work and heat transfer (DOK: 2)
- Describe the conditions under which thermal expansion and contraction occur (DOK: 2)
- Calculate the specific heat of an object (DOK: 3)

- Give examples of the means of heat transfer (DOK: 1)
- Describe the relationship between work and energy (DOK: Level 2)

Core Activities and Corresponding Instructional Methods:

1. For each chapter included in this unit of study, the teacher should present all pertinent information found under the concepts section of this unit in a way that aid in not only retention, but mastery of all key concepts and mandatory vocabulary for this unit of instruction. Some suggested means of presenting this information are PowerPoint notes, cloze notes format, skeleton outlines, and student generated notes that are taken during a teacher presentation.

2. Suggested labs include various activities that demonstrate how shape and density of an object impacts its buoyancy and how dropping a tennis ball from various heights can impact the potential and kinetic energy of the ball.

3. Present all unit vocabulary to students in a format that they can study for retention and application of knowledge. See appendix for the MANDATORY list of vocabulary words.

Assessments:

- **Diagnostic:**
  - Pretests
  - Ungraded homework
  - Class Discussions
  - Teachers observations
- **Formative:**
  - Quizzes
  - Assignments
  - Graded Homework Assignments
  - Practice Tests
  - Laboratory Exploration
  - PSSA Aligned Short Open Ended Questions
- **Summative:**
  - Unit Tests
  - Major Projects

Extensions: Optional recommended Inquiry Labs and Digital Path interactive multimedia practice opportunities. Students can research how energy changes in amusement park rides. Students can research STEM-based current event article on reputable news website. They can

write a summary of the article and a paragraph explaining the overarching significance/why should we care

Correctives:

- Re-teach and retest important concepts including mandatory vocabulary.
- Provide additional remediation opportunities for math applications.

Materials and Resources: See last page of curriculum

Curriculum Plan

Unit: 4: Work, Power, Simple Machines (Ch 14) **Marking Period:** 3

Standard(s): 3.1.7A1, 3.2.7.B, 3.2.8.B1
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Anchor(s): S7.C.2, S8.C.3.1, S8.C.3.1.1, S8.C.3.1.2, S8.C.3.1.3
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Big Idea #1: A force applied over a distance to move an object equals work, and work is equal to the transfer of energy to that object by the action of that force.

Essential Questions:

- When does a force do work?
- How are work and power related?
- How do machines make work easier?
- How are work input and work output related for a machine?
- How does the actual mechanical advantage of a machine compare to its ideal mechanical advantage?
- Why it the efficiency of a machine always less than 100 percent?
- What are the six types of simple machines?
- What determines the mechanical advantage of the six types of simple
- machines?

Concepts:

- Defining work
- Calculating work
- Defining power
- Calculating power
- Work input
- Work output
- Mechanical advantage
- Calculating mechanical advantage
- Efficiency
- Simple machines
- Compound machines

Competencies: After this unit of instruction, the students will be able to:

- Describe the conditions that must exist or a force to do work on an object
- Calculate the work done on an object
- Describe and calculate power
- Compare the units of watts and horsepower as they relate to power

- Describe what a machine is and how it makes work easier to do
- Relate the work input to a machine to the work output of the machine
- Compare a machine's actual mechanical advantage to its ideal mechanical advantage
- Calculate the ideal and actual mechanical advantages of various machines
- Explain why the efficiency of a machine is always less than 100 percent
- Calculate a machine's efficiency
- Name, describe, and give an example of each of the six types of simple machines

Overview: Students will gain an understanding of the concepts of work and power and how they relate to force, distance and time. Students will also gain and understanding of simple machines and how they relate to work and power.

Goals:

- For students to define the concepts of work and power
- For students to articulate the relationship between work power
- For students to calculate work and power with proper units
- For students to identify six simple machines and how each makes doing work easier
- For students to calculate mechanical advantage and efficiency while being able to explaining how those are improved by using simple machines

Objectives:

- Describe the conditions that must exist or a force to do work on an object (DOK: Level 1)
- Calculate the work done on an object (DOK: Level 2)
- Describe and calculate power (DOK: Level 2)
- Compare the units of watts and horsepower as they relate to power (DOK: Level 1)
- Describe what a machine is and how it makes work easier to do (DOK: Level 1 & 2)
- Relate the work input of a machine to the work output of the machine (DOK: Level 2)
- Compare a machine's actual mechanical advantage to its ideal mechanical advantage (DOK: Level 1)
- Calculate the ideal and actual mechanical advantages of various machines (DOK: Level 2)
- Explain why the efficiency of a machine is always less than 100 percent (DOK: Level 1)
- Calculate a machine's efficiency (DOK: Level 2)
- Name, describe, and give an example of each of the six types of simple machines (DOK: Level 1 & 2)
- Describe how to determine the ideal mechanical advantage of each type of simple machine (DOK: Level 1)
- Define and identify compound machines (DOK: Level 1)

Core Activities and Corresponding Instructional Methods:

1. For each chapter included in this unit of study, the teacher should present all pertinent information found under the concepts section of this unit in a way that aid in not only retention, but mastery of all key concepts and mandatory vocabulary for this unit of instruction. Some suggested means of presenting this information are PowerPoint notes, cloze notes format, skeleton outlines, and student generated notes that are taken during a teacher presentation.

2. A suggested hands-on application includes assigning students a simple machine and, in groups, create an informational poster and working model of the simple machines, presenting their research and demonstrating their model's functionality.

3. Additional suggested exploration extension is to have the students complete a webquest on Rube Goldberg.

4. Present all unit vocabulary to students in a format that they can study for retention and application of knowledge. See appendix for the MANDATORY list of vocabulary words.

Assessments:

- **Diagnostic:**
  - Pretests
  - Ungraded homework
  - Class Discussions
  - Teachers observations
- **Formative:**
  - Quizzes
  - Assignments
  - Graded Homework Assignments
  - Practice Tests
  - Laboratory Exploration
  - PSSA Aligned Short Open Ended Questions
- **Summative:**
  - Unit Tests
  - Major Projects

Extensions: Optional recommended Inquiry Labs and Digital Path interactive multimedia practice opportunities. Students will be given an assortment of materials and be required to make a Rube Goldberg machine to complete a given task. Students can research STEM-based

current event article on reputable news website. They can write a summary of the article and a paragraph explaining the overarching significance/why should we care

Correctives:

- Re-teach and retest important concepts including mandatory vocabulary.
- Provide additional remediation opportunities for math applications.

Materials and Resources: See last page of curriculum.

Curriculum Plan

Unit: 5: Classification of Matter (Ch 2 and 3) **Marking Period:** 3

Standard(s): 3.2.6.A2, 3.2.6.A4, 3.2.6.A5, 3.2.7.A1, 3.2.3.A1, 3.2.3.A4. 3.2.4.A4, 3.2.6.A3
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Anchor(s): S8.C.1.1.1, S8.C.1.1.2, S8.A.1.3, S8.A.1.3, S8.A.2.1, S8.A.2.2, S8.C.1.1.3
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Big Idea #1: Matter exists in many different forms, each of which has specific characteristics.

Essential Questions:

- What are elements?
- What are compounds?
- What are mixtures, suspensions, colloids?
- How are elements named?
- What are physical properties?
- What are chemical properties?

Concepts:

- Elements are pure substances that cannot be broken down into other substances.
- Compounds are a combination of two or more elements that are chemically combined.
- A mixture is a group of substances that still retain their individual identities.
- A suspension is a mixture that separates into layers over time.
- A colloid is a mixture that has medium sized particles but does not settle and cannot be separated.
- Physical properties are characteristics that can be observed or measured without changing the chemical composition of the substance itself.
- A chemical change is when a substance is altered to make a new substance or substances.

Competencies: As a result of this unit of instruction, students will be able to:

- Distinguish between all types of matter
- Identify physical and chemical changes
- Describe methods for creating physical and chemical changes in matter
- Master all key vocabulary associated with this unit of instruction

Big Idea #2: There are three states in which matter exists in and they are governed by laws

Essential Questions:

- What are the three states of matter?
- What is Charles's Law?

- What is Boyle's Law?
- What is a phase change?
- What causes a phase change?

Concepts:

- Matter can exist as a solid, liquid or gas.
- Charles's Law states that the volume of a gas is directly proportional to its temperature, given that all other factors are constant.
- Boyle's Law states that the volume of a gas is inversely proportional to its pressure, given that all other factors are constant.
- A phase change is when matter becomes a different state than it previously existed.
- Adding or taking away energy causes a phase change.

Competencies: As a result of this unit of instruction, students will be able to:

- Identify the state of matter something exists in.
- Predict what will happen to the phase of matter under different energy conditions.
- Correctly apply the principles of Charles's and Boyle's Law in open ended practice problems.

Overview: This unit focuses on introducing then expanding on student knowledge concerning atomic structure and basic knowledge of matter to prepare students for the next unit of study that focuses on the actual chemical interactions and reactions of Chemistry. By attaining this foundational knowledge regarding matter, students will then be able to better understand the mechanisms of atomic chemistry.

Goals:

- For students to be able to apply universal laws that govern matter
- For students to accurately calculate unknown variables when provided with givens in the common gas law
- For students to identify changes of matter based on various conditions

Objectives:

- Distinguish between all types of matter (DOK level 1)
- Identify physical and chemical changes (DOK level 1)
- Describe methods for creating physical and chemical changes in matter (DOK level 1)
- Master all key vocabulary associated with this unit of instruction (DOK level 2)
- Identify the state of matter something exists in (DOK level 1)
- Predict what will happen to the phase of matter under different energy conditions (DOK level 2)

- Correctly apply the principles of Charles's and Boyle's Law in open ended practice problems (DOK level 4)

Core Activities and Corresponding Instructional Methods:

1. For each chapter included in this unit of study, the teacher should present all pertinent information found under the concepts section of this unit in a way that aid in not only retention, but mastery of all key concepts and mandatory vocabulary for this unit of instruction. Some suggested means of presenting this information are PowerPoint notes, cloze notes format, skeleton outlines, and student generated notes that are taken during a teacher presentation.

2. Suggested lab activities provided in textbook and supplemental resources can be implemented at teacher discretion to enhance comprehension

3. Present all unit vocabulary to students in a format that they can study for retention and application of knowledge. See appendix for the MANDATORY list of vocabulary words.

Assessments:

- **Diagnostic:**
  - Pretests
  - Ungraded homework
  - Class Discussions
  - Teachers observations
- **Formative:**
  - Quizzes
  - Assignments
  - Graded Homework Assignments
  - Practice Tests
  - Laboratory Exploration
  - PSSA Aligned Short Open Ended Questions
- **Summative:**
  - Unit Tests
  - Major Projects

Extensions: Optional recommended Inquiry Labs and Digital Path interactive multimedia practice opportunities. Students will watch as the teacher performs various mini-demonstrations that show either a physical or chemical change. The students then must identify the type of change that is occurring and provide a justification for their choice using observable evidence. Students can research STEM-based current event article on reputable

news website. They can write a summary of the article and a paragraph explaining the overarching significance/why should we care

Correctives:

- Re-teach and retest important concepts including mandatory vocabulary
- Provide additional remediation opportunities for math applications.

Materials and Resources: See last page in curriculum.

Curriculum Plan

Unit: 6: Atomic Structure (Ch 4 and 5) **Marking Period:** 4

Standard(s): 3.2.7.A2, 3.2.10.A2, 3.2.8.A2
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Anchor(s): S8.C.1.1.1, S8.A.3.2, S8.C.1.1.1, S8.A.3.3, S11.C.1.1.4
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Big Idea #1: Atoms are held together by the attraction of the opposite forces that hold them together.

Essential Questions:

- What are the three subatomic particles that atoms are made up of?
- What are the charges of those particles?
- What are the positions of those particles in the structure of the atom?
- Who were some of the major contributing scientists to the development of modern day atomic theory?
- What are the rows on the periodic table called?
- What are the columns on the periodic table called?
- What do the numbers above and below the element symbol stand for?
- Where are metals found? Nonmetals? Transition metals? Metalloids? Alkaline Earth Metals? Alkali Metals? Halogens? Noble Gases?

Concepts:

- Atoms are made up of protons, electrons and neutrons.
- Protons have a positive charge, neutrons have a neutral charge and electrons have a negative charge.
- Both protons and neutrons are found in the nucleus of the atom.
- Electrons are found orbiting the nucleus.
- Dalton, Thompson, Rutherford and Bohr were four of the major contributors to modern atomic theory.
- Rows in the periodic table are known as periods, and elements found in the same period have the same characteristics.
- Columns are known as groups, and elements found in the same groups have similar characteristics.
- The number above each element symbol represents the atomic number.
- The number below the element symbol and name represents the atomic mass of that element.
- Metals are found on the left of the table while nonmetals are found on the right.

- Transition metals are found as you approach the "step" and metalloids are found along the "step".
- Group 1A is known as the Alkali Metals, Group 2A is known as the Alkaline Earth Metals, Group 7A is known as the Halogens, and Group 8A is known as the Noble gases.
- All of the aforementioned groups have specific physical and chemical distinguishing characteristics.

Competencies: As a result of this unit of instruction, students will be able to:

- Identify the particles that make up an atom.
- Identify the charges of those particles.
- Cite the location of the subatomic particles in an atom
- Describe the four major scientist's contributions to atomic theory.
- Compare and contrast those theories.
- Identify the differences between elements found in the same period versus group.
- Describe predicted characteristics and behaviors of elements based on their locations or families they belong to.

Overview: This unit focuses on reviewing and expanding on student knowledge concerning atomic structure and properties of the periodic table so as to prepare students for the next unit of study that focuses on the actual chemical interactions and reactions of Chemistry

Goals:

- For students to describe the three subatomic particles (location, charges, and masses).
- For students to compare and contrast the major atomic theories and describe how those theories lead to further discovery.
- For students to have a working knowledge of the Periodic Table of Elements

Objectives:

- Identify the particles that make up an atom (DOK level 1)
- Identify the charges of those particles (DOK level 1)
- Cite the location of the subatomic particles in an atom (DOK level 3)
- Describe the four major scientist's contributions to atomic theory (DOK level 2)
- Compare and contrast those theories (DOK level 2)
- Be able to apply that knowledge and have a working knowledge of the periodic table for the remainder of the year during laboratory explorations and subsequent units of Chemistry instruction (DOK level 4)

Core Activities and Corresponding Instructional Methods:

1. For each chapter included in this unit of study, the teacher should present all pertinent information found under the concepts section of this unit in a way that aid in not only retention, but mastery of all key concepts and mandatory vocabulary for this unit of instruction. Some suggested means of presenting this information are PowerPoint notes, cloze notes format, skeleton outlines, and student generated notes that are taken during a teacher presentation.

2. Suggested lab activities provided in textbook and supplemental resources can be implemented at teacher discretion to enhance comprehension.

3. Present all unit vocabulary to students in a format that they can study for retention and application of knowledge. See appendix for the MANDATORY list of vocabulary words.

Assessments:

- **Diagnostic:**
  - Pretests
  - Ungraded homework
  - Class Discussions
  - Teachers observations
- **Formative:**
  - Quizzes
  - Assignments
  - Graded Homework Assignments
  - Practice Tests
  - Laboratory Exploration
  - PSSA Aligned Short Open Ended Questions
- **Summative:**
  - Unit Tests
  - Major Projects

Extensions: Optional recommended Inquiry Labs and Digital Path interactive multimedia practice opportunities. Students will use the chemical symbols on the periodic table to create an original license plate using a word that represents an aspect of their personality or something that interests them, and will illustrate it accordingly. Have the student design his or her own presentation describing why the halogens and the alkali metals are so highly reactive with each other. Students can research STEM-based current event article on reputable news website. They can write a summary of the article and a paragraph explaining the overarching significance/why should we care

Correctives:

- Re-teach and retest important concepts including mandatory vocabulary
- Provide additional remediation opportunities for math applications.

Materials and Resources: See last page of curriculum.

Curriculum Plan

Unit: 7: Chemical Interactions (Ch 6 & 7) **Marking Period:** 4

Standard(s): 3.2.6.A4, 3.2.7.A4
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Anchor(s): S8.C.1.1.1, S8.C.1.1.3, S8.A.1.3, S8.A.2.1, S8.A.2.2, S8.A.3.2
http://static.pdesas.org/content/documents/CF-Science_MS_PhysicalScience.pdf

Big Idea #1: Atoms bond in different ways, and those bonding differences give substances their unique characteristics.

Essential Questions:

- When is an atom unlikely to react?
- What is one way in which elements can achieve stable electron configuration?
- How does the structure of an ionic compound affect its properties?
- How are atoms held together in a covalent bond?
- What happens when atoms don't share electrons equally?
- What factors determine whether a molecule is polar?
- How do attractions between polar molecules compare to attractions between nonpolar molecules?
- What information do the name and formula of an ionic compound provide?
- What information do the name and formula of a molecular compound provide?
- What are the forces that give a metal its structure as a solid?
- How do metallic bonds produce some of the typical properties of metals?
- How are the properties of alloys controlled?

Concepts:

- Stable Electron Configuration
- Transfer of electrons
- Formation of ionic bonds
- Properties of ionic compounds
- Formation of covalent bonds
- Properties of covalent compounds
- Polarity of molecules
- Polyatomic ions
- Binary ionic compounds
- Naming compounds
- Writing chemical formulas
- Metallic bonding
- Properties of metallic bonding

Competencies: After this unit of instruction, students will be able to:

- Recognize stable electron configurations
- Predict an elements chemical properties using the number of valence electrons and electron dot diagrams
- Describe how ionic bonds form and how ionization energy affects this process
- Predict the composition of an ionic compound from its chemical formula
- Relate the properties of ionic compounds to the structure of crystal lattices
- Describe how covalent bonds form and the attractions that keep atoms together in molecules
- Compare polar and nonpolar bonds
- Demonstrate how polar bonds affect the polarity of a molecule
- Compare the attractions between polar and nonpolar molecules
- Recognize and describe binary ionic compounds, metals with multiple ions and polyatomic ions
- Determine chemical formulas for ionic and molecular compounds
- Describe the structure and strength of bonds in metals
- Relate the properties of metals to their structure
- Define an alloy and demonstrate how the composition of an alloy affects its properties

Big Idea #2: There are many different ways that substances can interact with each other and each of those interactions follow specific rules and provide specific expected outcomes.

Essential Questions:

- What is the law of conservation of mass?
- Why must chemical equations be balanced?
- Why do chemists use the mole?
- How can you calculate the mass of a reactant or product in a chemical reaction?
- What are the general types of chemical reactions?
- How did the discovery of subatomic particles affect the classification of reactions?
- What happens to chemical bonds during a chemical reaction?
- What happens to energy during a chemical reaction?
- What does a reaction rate tell you?
- What factors cause reaction rates to change?
- Under what conditions do physical and chemical equilibria occur?
- How do equilibrium systems respond to change?

Concepts:

- Using equations to represent reactions
- Conservation of mass
- Balancing equations
- Counting with moles

- Molar mass
- Mole-mass conversions
- Converting mass to moles
- Converting moles to mass
- Molar ratios
- Synthesis reactions
- Decomposition reactions
- Single replacement reactions
- Double replacement reactions
- Combustion
- Oxidation
- Reduction
- Breaking and forming bonds
- Endothermic reactions
- Exothermic reactions
- Conservation of energy
- Factors that affect reaction rates
- Types of equilibrium
- Factors that affect equilibrium

Competencies: After this unit of instruction, the students will be able to:

- Interpret Chemical equations in terms of reactants, products, and
- conservation of mass
- Balance chemical equations by manipulating coefficients
- Convert between moles and mass of a substance using molar mass
- Calculate amounts of reactants or products by using molar mass, mole ratios and balanced chemical equations
- Classify chemical reactions as synthesis, decomposition, single-replacement, double-replacement or combustion reactions
- Describe oxidation-reduction reactions and relate them to other classifications of chemical reactions
- Describe the energy changes that take place during chemical reactions
- Classify chemical reactions as exothermic or endothermic
- Explain how energy is conserved during chemical reactions
- Explain what a reaction rate is
- Describe the factors that affect chemical reaction rates
- Identify and describe physical and chemical equilibrium
- Describe the factors affecting chemical equilibrium

Overview: This unit is designed to expand on the fundamental knowledge about matter and its characteristics. Students will learn the different ways elements, when in the presence of other elements, will react and interact with each other and the basic patterns and rules that elements of certain characteristics follow within those interactions. Natural connections between these

interactions and the rules that govern them and other areas of scientific study, such as Biology and Earth Science will be drawn to deepen the students' awareness for the interconnections between these disciplines. These connections will further deepen the meaning of the content and serve as a natural review and preview of material that will be assessed on the 8th grade Science PSSA as well as the Keystone Biology exam.

Goals:

- For students to build a solid body of knowledge about why certain substances react and interact with others in the way that they do as well as the factors that can control or affect those interactions are.
- For students to be able to apply those principals of chemical interactions to everyday, real world situations in a way that is meaningful and helpful to their lives.
- For students to understand more deeply why certain biochemical reactions, such as photosynthesis and cellular respiration, occur in the manner in which they do, making them essential to life

Objectives:

- Recognize stable electron configurations (DOK: Level 1)
- Predict an element's chemical properties using the number of valence electrons and electron dot diagrams (DOK: Level 2)
- Describe how ionic bonds form and how ionization energy affects this process (DOK: Levels 1 & 2)
- Relate the properties of ionic compounds to the structure of crystal lattices (DOK: Level 2)
- Describe how covalent bonds form and the attractions that keep atoms together in molecules (DOK: Levels 2)
- Compare polar and nonpolar bonds (DOK: Level 2)
- Demonstrate how polar bonds affect the polarity of a molecule (DOK: Level 2)
- Compare the attractions between polar and nonpolar molecules (DOK: 2)
- Recognize and describe binary ionic compounds, metals with multiple ions and polyatomic ions (DOK: Level 1)
- Determine chemical formulas for ionic and molecular compounds (DOK: 1)
- Describe the structure and strength of bonds in metals (DOK: Level 2)
- Relate the properties of metals to their structure (DOK: Level 2)
- Define an alloy and demonstrate how the composition of an alloy affects its properties (DOK: Level 1)

- Interpret chemical equations in terms of reactants, products, and conservation of mass (DOK: Level 2)
- Balance chemical equations by manipulating coefficients (DOK: Level 2)
- Convert between moles and mass of a substance using molar mass (DOK: Level 2)
- Calculate amounts of reactants or products by using molar mass, mole ratios and balanced chemical equations (DOK: Level 2)
- Classify chemical reactions as synthesis, decomposition, single-replacement, double-replacement or combustion reactions (DOK: Level 1)
- Describe oxidation-reduction reactions and relate them to other classifications of chemical reactions (DOK: Levels 1 & 2)
- Describe the energy changes that take place during chemical reactions (DOK: Level 1)
- Classify chemical reactions as exothermic or endothermic (DOK: Level 1)
- Explain how energy is conserved during chemical reactions (DOK: Level 2)
- Explain what a reaction rate is (DOK: Level 1)
- Describe the factors that affect chemical reaction rates (DOK: Level 1 & 2)
- Identify and describe physical and chemical equilibrium (DOK: Level 1)
- Describe the factors affecting chemical equilibrium (DOK: Level 2)

Core Activities and Corresponding Instructional Methods:

1. For each chapter included in this unit of study, the teacher should present all pertinent information found under the concepts section of this unit in a way that aid in not only retention, but mastery of all key concepts and mandatory vocabulary for this unit of instruction. Some suggested means of presenting this information are PowerPoint notes, cloze notes format, skeleton outlines, and student generated notes that are taken during a teacher presentation.

2. Suggested lab activities provided in textbook and supplemental resources can be implemented at teacher discretion to enhance comprehension

3. Present all unit vocabulary to students in a format that they can study for retention and application of knowledge. See appendix for the MANDATORY list of vocabulary words.

Assessments:

- **Diagnostic:**
  - Pretests
  - Ungraded homework
  - Class Discussions
  - Teachers observations

- **Formative:**
  - Quizzes
  - Assignments
  - Graded Homework Assignments
  - Practice Tests
  - Laboratory Exploration
  - PSSA Aligned Short Open Ended Questions
- **Summative:**
  - Unit Tests
  - Major Projects

Extensions: Optional recommended Inquiry Labs and Digital Path interactive multimedia practice opportunities. Students can engage in Inquiry Activity on pg. 191 in the textbook as an opening investigation to the topics that will be discussed in this unit. Students can research STEM-based current event article on reputable news website. They can write a summary of the article and a paragraph explaining the overarching significance/why should we care

Correctives:

- Re-teach and retest important concepts including mandatory vocabulary
- Provide additional remediation opportunities for math applications.

Materials and Resources: (If the materials and resources are consistent throughout the curriculum, then place “Materials and Resources” on the last page of the curriculum and list them once.)

Primary Textbook(s) Used for this Course of Instruction

Name of Textbook: Physical Science in Action with Earth and Space Science

Textbook ISBN #: 978-0-13-362818

Textbook Publisher &Year of Publication: Pearson Education, 2009

Curriculum Textbook is utilized in (title of course): 8th Grade Honors Science

Appendix A: Mandatory Vocabulary List

Chapter One: Foundations of Chemistry
Science
Technology
Chemistry
Physics
Geology
Astronomy
Biology
Scientific notation
Length
Mass
Volume
Density
Conversion factor
Precision
Significant figures
Accuracy
Thermometer
Slope
Direct proportion
Inverse proportion
Scientific Method
Observation
Hypothesis
Manipulated Variable
Responding Variable
Controlled variable
Scientific theory
Scientific law
Model

Chapter Eleven: Motion
Frame of Reference
Relative motion
Distance
Vector
Resultant vector
Speed
Average Speed
Instantaneous speed
Velocity

Acceleration
Free fall
Constant acceleration
Linear
Nonlinear graph

Chapter Twelve: Forces and Motion
Force
Newton
Net force
Friction
Static friction
Sliding friction
Rolling friction
Fluid friction
Air resistance
Gravity
Terminal velocity
Projectile motion
Inertia
Mass
Weight
Momentum
Law of conservation of momentum
Electromagnetic force
Strong nuclear force
Weak nuclear force
Gravitational force
Centripetal force

Chapter Thirteen: Forces in Fluids
Pressure
Pascal
Fluid
Lift
Hydraulic system
Buoyancy
Buoyant force
Archimedes' principal

Chapter 15: Energy
Energy
Kinetic energy
Potential energy

Gravitational potential energy
Elastic potential energy
Mechanical energy
Thermal energy
Chemical energy
Electrical energy
Electromagnetic energy
Nuclear energy
Energy conversion
Nonrenewable energy resources
Fossil fuels
Renewable energy resources
Hydroelectricity energy
Solar energy
Geothermal energy
Biomass energy
Hydrogen fuel cell
Energy conservation

Chapter 16: Heat
Heat
Temperature
Absolute zero
Thermal expansion
Specific heat
Calorimeter
Conduction
Thermal conductor
Thermal insulator
Convection
Convection current
Radiation
Thermodynamics
Heat engine
Waste heat

Chapter Fourteen: Work, power, simple machines
Work
Power
Horsepower
Joule
Watt
Machine
Input distance

Output force
Work output
Input force
Work input
Output distance
Mechanical advantage
Actual mechanical advantage
Ideal mechanical advantage
Efficiency
Lever
Fulcrum
Input arm
Output arm
Wheel and axle
Inclined plane
Wedge
Screw
Pulley
Compound machine

Chapter Two: Properties of Matter
Pure substance
Atom
Element
Compound
Heterogeneous mixture
Homogeneous mixture
Solution
Suspension
Colloid
Physical property
Viscosity
Conductivity
Malleability
Melting point
Boiling point
Filtration
Distillation
Physical change
Chemical property
Flammability
Reactivity
Chemical change
Precipitate

Chapter Three: States of Matter
Solid
Liquid
Gas
Kinetic energy
Pressure
Absolute zero
Charles's Law
Boyle's Law
Phase change
Endothermic
Heat of fusion
Exothermic
Vaporization
Heat of vaporization
Evaporation
Vapor pressure
Condensation
Sublimation
Deposition

Chapter Four: Atomic Structure
Nucleus
Proton
Electron
Neutron
Atomic number
Mass number
Isotopes
Energy levels
Electron cloud
Orbital
Electron configuration
Ground state

Chapter Five: Periodic Table
Periodic table
Period
Group
Periodic law
Atomic mass unit
Metals
Transition metals

Nonmetals
Metalloids
Valence electron
Alkali metals
Alkaline earth metals
Halogens
Noble gases

Chapter Six: Chemical Bonds
Electron dot diagram
Ion
Anion
Cation
Chemical bond
Ionic bond
Chemical formula
Crystals
Covalent bond
Molecule
Polar covalent bond
Polyatomic ion
Metallic bond
Alloy

Chapter Seven: Chemical Reactions
Reactants
Products
Chemical equation
Coefficients
Mole molar mass
Synthesis reaction
Decomposition reaction
Single replacement reaction
Double replacement reaction
Combustion reaction
Oxidation-reduction reaction
Chemical energy
Exothermic reaction
Endothermic reaction
Reaction rate
Catalyst
Equilibrium
Reversible reaction

Appendix B: Materials and Resources

- Primary Textbook
- Supplemental assignments and activities from teacher's edition and lab workbook
- SAS Website
- Various websites and online resources, including but not limited to YouTube videos/clips, PhET simulations, assorted diagrams and illustrations
- Movies and videos to reinforce content including but not limited to October Sky, Wall-E, Echo, Fern Gully, The Day After Tomorrow, Apollo 13 (clips), The Martian, Tron, Big Hero 6, The Lorax, assorted Mythbusters/NOVA/Bill Nye clips and episodes