Course Name:	Physical Science		
Credits:	1		
Prerequisites:	N/A		
Description:	Designed to expose students to various scientific descriptions. The goal is science literacy. The units covered include, but are not limited to: Basic Chemistry (the Nature of Matter and the Changes in Matter) and Basic Physics (Motion, Forces and Energy). Students will learn problem-solving skills and will be shown how science relates to their lives. Lab work is required and large scale cumulative projects replace Final Exams.		
Academic Standards:	Next Generation Science Standards (NGSS)		
Units:	**Time**	**Unit Standards:**	**Unit Outcomes:**
Nature of Science	2 weeks	HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and want. HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and want. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
Motion	3 weeks	HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. HS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

Work, Force and Power	3 weeks	HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
Momentum and Mechanical Advantage	3 weeks	HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information. HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.	Evaluate questions about the advantages of using a digital transmission and storage of information. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
Energy Conversion and Conservation	4 weeks	HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects). HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects). Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

Electricity and Magnetism	4 weeks	HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. HS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. HS-PS3-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. HS-PS4-4. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
Nature of Matter	5 weeks	HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
Diversity of Matter	5 weeks	HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. HS-PS2-6.Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

Waves	4 weeks	HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. HS-PS1-8. (if the topic is chosen) Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. HS-PS4-5.(if topic is chosen) Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

Unit Name: Nature of Science	**Length**: 2 weeks
Standards: HS-ETS1-1 HS-ETS1-2 HS-PS1-7	**Outcomes**: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and want. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. This unit is the foundation for determining differentiation of important life skills like: identifying a scientific problem, making assumptions based on prior knowledge, reading measurements from various tools, collecting data, analyzing data, and graphing conclusive evidence.
Essential Questions: The use of measuring devices and their units of measure is essential to learning about scientific phenomenon. What is the difference between "math" math and "science" math? **Academic Vocabulary:** Part 1 - Scientific Method/PHEOC, Independent Variable, Dependent Variable, Constant:, Controls, Standard Part 2 - Volume, Mass, Density, Qualitative Data, Quantitative Data	**Learning Targets:** Identify the steps used to solve scientific phenomenon. Describe why scientists use variables. Compare and contrast science vs. technology. Know and apply the prefixes that define the metric system. Identify units measure and symbols for those units of measure. Utilize the correct tools to length, mass, volume, density, time, and temp. Identify the 3 types of graphs and utilize them in conclusions. Analyze data from graphs.
Topic 1: **Metric System and Units of Measure**	**Length**: 1 week
Lesson Frame: Metric System Stairway	We will study and manipulate numbers for the metric system.
	I will know how to use the metric stairway.
Lesson Frame: Metric Mania Scavenger Hunt	We will convert numbers and measures into and out of metric system.
	I will practice my metric conversions.
Lesson Frame: Metric System Challenge	We will take measurements in length, mass and volume.
	I will be able to use the proper tool for the job.
Performance Tasks: Measuring Objects Unit Conversions within Metric System Unit Conversions from Standard to Metric System	Notes:
Topic 2: **Density**	**Length**: 1 week
Lesson Frame: Density Pyramids	We will learn to use the density pyramid for converting measures.

	I will make conversion with the density formula for mass and volume.
Lesson Frame: Density Measurements, tools and units	We will demonstrate several ways of measuring.
	I will make volume measures using a ruler, grad cylinder and displacement.
Lesson Frame: Archimedes' Principle	We will analyze Archimedes Principle.
	I will use buoyancy to learn about displacement, surface area, floating and sinking.
Performance Tasks: Graphing Statistical Data of Common Elements	Notes:

Unit Name: **Motion**	**Length**: 3 weeks
Standards: HS-PS2-3 HS-PS2-1 HS-PS2-2 HS-PS2-4	**Outcomes:** Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
Essential Questions: What is the connection between the measurements, units and tools and real life scenarios? How can you relate information the to speeding, car accidents, safety and mechanics? **Academic Vocabulary:** Distance, Displacement, Speed, Average Speed, Instantaneous Speed, Velocity, Acceleration, Deceleration, Newton's 1st Law	**Learning Targets:** Distinguish between distance and displacement. Explain the difference between speed and velocity. Interpret motion graphs. Identify how acceleration, time, and velocity are related. Explain how positive and negative acceleration affect motion. Describe how to calculate the acceleration of an object.
Topic 1: **Speed vs. Velocity**	**Length**: 2 weeks
Lesson Frame: Exploring Reference Points, Newton's 1st Law	We will devise ways to measure distance and time.
	I will know what a reference point is.
Lesson Frame: Calculating speed of vehicles without RADAR	We will analyze speed and velocity.
	I will calculate the speed and velocity of various objects.
Lesson Frame: Unit Conversions Km/m = mph	We will set a lab to measure speed of cars.
	I will calculate the speed of random cars and convert the speed to a unit I am familiar with.
Performance Tasks: Bowling Ball - Change in Velocity Speed Trap 400m walk vs.run	Notes:
Topic 2: **Acceleration and Deceleration**	**Length:** 1 week
Lesson Frame: Describing Acceleration	We will continue with our car speed lab, only this time we will make observation at the stop sign.
	I will be able to contrast acceleration and deceleration.
Lesson Frame: Exploring changes in direction	We will make and use an accelerometer.
	I will utilize my accelerometer to make measurements.

Lesson Frame: Acceleration Formula and Calculations	We will download an app for acceleration then compare our calculations to the app.
	I will be able to see how accurately I make measurements.
Performance Tasks: Starting Points vs. Stopping Points Centripetal Force and Ellipses Deceleration at a Stop Sign Olympic Sprinters Acceleration in the 100m	Notes:

Unit Name: **Work, Force and Power**	**Length:** 3 weeks
Standards: HS-PS1-5. HS-PS3-4. HS-PS4-1.	**Outcomes:** Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
Essential Questions: Do our students possess the capacity to take these measurements/calculations and manipulate them to support a real life situation? **Academic Vocabulary:** Force, Net Force, Balanced Force, Inertia, Work, Power, Types of Force, Free Body Diagram, Newton's 1st Law, 2nd Law, 3rd Law	**Learning Targets**: Explain how force and motion are related. Describe what inertia is and how it is related to Newton's first law of motion. Identify the forces and motion that are present during a car crash. Apply knowledge of forces to Free Body Diagrams. Site examples for Newton's Laws. Interpret and apply terminology.
Topic 1: **Force**	**Length**: 1 week
Lesson Frame: Balanced and Unbalanced forces (Newton's 1st Law)	We will demonstrate inertia.
	I will define and apply Newton's 1st Law (inertia).
Lesson Frame: Types of Force	We will demonstrate multiple forces.
	I will be able to determine differences in force.
Lesson Frame: Newton's 2nd Law	We will utilize the force formula for calculations and then conversions.
	I will measure mass and acceleration to get force.
Performance Tasks: Crash Reconstruction - Inertia Free Body Diagrams Making and Reading Accelerometers Whirlybird Contest	Notes:

Topic 2: **Work and Power**	**Length**: 2 weeks
Lesson Frame: Exploring Work, Direction and Weight	We will observe moving objects and monitor their work output.
	I will know how to calculate work. w = f * d.
Lesson Frame: Calculating Work	We will demonstrate work in and work out for efficiency.
	I will will be able to calculate the work under several conditions.
Lesson Frame: Calculating Power	We will demonstrate power.
	I will know how to calculate power P = w/t under specific conditions.
Performance Tasks: Family of squirrels creating electricity Can Opener Lab - machines multiplying force Comparing and contrasting horsepower and power from WPS Calculating your own force, work and power (steps lab)	Notes: Research and compare horsepower, electrical power and normal power.

Unit Name: **Momentum and Mechanical Advantage**	**Length:** 3 weeks
Standards: HS-PS4-2 HS-PS4-3	**Outcomes**: Evaluate questions about the advantages of using a digital transmission and storage of information. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
Essential Questions: How can the use of simple vs. compound machines be compared and contrasted? How can various mechanical apparatus' that display the intricacies of the laws of motion and gravity be designed, buildt and tested? **Academic Vocabulary**: Newton's Second Law of Motion, Friction, Static Friction, Sliding Friction, Air Resistance, Gravity, Weight, Centripetal Acceleration, Centripetal Force, Newton's Third Law of Motion, Momentum, Mechanical Advantage, Kinesiology	**Learning Targets:** Apply Newton's second law of motion. Describe the three different types of friction. Observe the effects of air resistance on falling objects. Describe the gravitational force. Distinguish between mass and weight. Explain why objects that are thrown will follow a curved path. Compare circular motion with motion in a straight line. State Newton's third law of motion. Calculate momentum. Recognize when momentum is conserved. Explain how machines make doing work easier. Calculate the mechanical advantage of a machine. Calculate the efficiency of a machine. Describe the six types of simple machines. Explain how the different types of simple machines make doing work easier. Calculate the ideal mechanical advantage of the different types of simple machines.

Topic 1: **Momentum/Newton's Laws**	**Length**: 2 weeks
Lesson Frame: Newton's 3rd Law	We will identify Newton's 3rd Law and apply it.
	I will know that every action yields an equal and opposite reaction.
Lesson Frame: Calculating Momentum Law of Conservation of Momentum	We will demonstrate momentum under various conditions.
	I will measure mass and velocity to get momentum.
Lesson Frame: Friction and Gravity	We will demonstrate all different kinds of friction.
	I will know how to make a free body diagram for multiple scenarios.

Performance Tasks: Fitch Barrier Calculations Action Reaction - Bouncing Ball Collisions - Data Collection and Graphing Construction of the Great Pyramids Friction Labs	Notes:
Topic 2: **Mechanical Advantage and Efficiency**	**Length:** 1 week
Lesson Frame: Compare and Contrast MA and Efficiency	We will demonstrate work in and work out.
	I will know how to calculate mechanical advantage of a can opener.
Lesson Frame: Simple Machines	We will introduce the 6 simple machines with all their variations.
	I will ID simple machines.
Lesson Frame: Machines in the Human Body	We will learn the basic of kinesiology.
	I will be able to match human movement examples to the 3 classes of levers.
Performance Tasks: Whirly Bird Contest (part 2) Identify variations in simple machines Calculate Ideal MA from three types of levers ID Pulleys and Levers in the Human Machine Paper Tower Contest	Notes:

Unit Name: **Energy Conversion and Conservation**	**Length**: 4 weeks
Standards: HS-PS3-1 HS-PS3-2 HS-PS3-3	**Outcomes:** Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects). Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
Essential Questions: How can you to plan, build and present a Rube Goldberg Machine? **Academic Vocabulary:** Kinetic Energy, Joule, Potential Energy, Elastic Potential Energy, Chemical Potential Energy, Gravitational Potential Energy, Temperature, Thermal Energy, Heat, Specific Heat, Conduction, Convection, Radiation, Insulator, Thermodynamics, First Law of Thermodynamics, Second Law of Thermodynamics, Internal Combustion Engine	**Learning Targets**: Distinguish between kinetic and potential energy. Calculate kinetic energy. Describe different forms of potential energy. Calculate gravitational potential energy. Describe how energy can be transformed from one form to another. Explain how the mechanical energy of a system is the sum of the kinetic and potential energy. Discuss the law of conservation of energy. Define temperature. Calculate the change in thermal energy. Compare and contrast the transfer of thermal energy by conduction, convection, and radiation. Describe the first and second laws of thermodynamics. Explain how an internal combustion engine works. Explain how a refrigerator transfers thermal energy from a cool to a warm temperature.
Topic 1: **Energy Conversion**	**Length**: 2 weeks
Lesson Frame: Nature of Energy - Listing Forms and Examples	We will demonstrate various forms of energy.
	I will know at least 10 different forms of energy.
Lesson Frame: Calculating Potential and Kinetic Energy	We will ID the two types of energy.
	I will compare and contrast potential and kinetic energy.
Lesson Frame: Measuring and Converting Temperature	We will learn how to measure and convert temperature.
	I will know the 3 different temperature measurements (F, C, and K).

Performance Tasks: Comeback Can Lab - Data Collection and Graphing Exothermic vs Endothermic Reactions Demo Ice Cube Contest - Design and build an insulated container	Notes:
Topic 2:**Energy Conservation**	**Length**: 2 weeks
Lesson Frame: Law of Conservation of Energy	We will analyze the law of conservation of energy.
	I will apply the law of conservation of energy by reviewing ecology pyramids.
Lesson Frame: Heat Loss Calculations - Residential Insulation	We will research formulas for energy loss and energy conservation.
	I will be able to read and understand a heat calc.
Lesson Frame: Who was Albert Einstein? Who was Rube Goldberg?	We will build a timeline for Einstein and Goldberg from birth to death.
	I will know 2 influences from Al and Rube dealing with energy science.
Performance Tasks: Orbits, Ellipses and Energy What goes up must come down R- Values Rube Goldberg Machines	Notes:

Unit Name: **Electricity and Magnetism**	**Length**: 4 weeks
Standards: HS-PS1-3 HS-PS2-4 HS-PS2-5 HS-PS3-5 HS-PS4-4	**Outcomes:** Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
Essential Questions: How do the basics of electricity and power relate to consumer goods and affairs in relation to safety, technology, and conservation? **Academic Vocabulary:** Static Electricity, Law of Conservation of Charge, Conductor, Insulator, Charging by Contact, Charging by Induction, Electric Current, Voltage Difference, Circuit, Resistance, Ohm's Law, Series Circuit, Parallel Circuit, Electrical Power, AC, DC	**Learning Targets:** Describe how electric charges exert forces on each other. Compare the strengths of electric and gravitational forces. Distinguish between conductors and insulators. Explain how objects become electrically charged. Describe how voltage difference causes current to flow. Explain batteries produce a voltage difference in a circuit. List the factors that affect an object's electrical resistance. Define Ohm's Law. Describe the difference between series and parallel circuits. Recognize the function of circuit breakers and fuses. Calculate electrical power. Calculate the electrical energy used by a device. Compare and Contrast AC -vs- DC.

Topic 1: **Electricity and Ohm's Law**	**Length**: 2 weeks
Lesson Frame: Electrical Charge	We will demonstrate flow of electricity.
	I will model static electricity.
Lesson Frame: OHM's Law - Calculations	We will learn the three components of electrical conduction.
	I will use Ohm's law to calculate current, volts and resistance.
Lesson Frame: Identifying Circuits	We will build circuits to get light bulbs to work.
	I will know the difference between parallel and series circuit.
Performance Tasks: Electricity in Everyday Life - Lab Build a Voltaic Cell - ID Volts, Current, and Resistance- Lab Investigating Battery Additions Build Series and Parallel Circuits - Lab	Notes: Must be able to label (Ohm's Law) volts, current, resistance on circuits.

Topic 2: **Electrical Power**	**Length**: 2 weeks
Lesson Frame: Identify and Calculate Residential Electrical Power	We will ID the underwriters laboratory labels on electrical appliances.
	I will know what UL means and where to locate it.
Lesson Frame: Energy as commodity/price per KW/h daily?	We will research the cost energy per Kilowatt Hour daily.
	I will locate major appliances in my home and calculate cost/KWh to run them.
Lesson Frame: Who was Thomas Edison? Who was Nikola Tesla?	We will compare and contrast Edison and Tesla inventions and ideas.
	I will know the history of and difference between AC and DC.
Performance Tasks: Watts Going On - Scavenger Hunt/Calculations of KW/h per month Compare and Contrast AC/DC	Notes:

Unit Name: **Nature of Matter**	**Length**: 4 weeks
Standards: HS-PS1-1 HS-PS1-2 HS-PS1-3	**Outcomes:** Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
Essential Questions: How do you interpret and apply the rules for the hierarchy of chemistry? How does the learning of a language associate to chemistry? **Academic Vocabulary**: Atom, Nucleus, Proton, Neutron, Electron, Quark, Electron Cloud, Atomic Number, Mass Number, Isotope, Average Atomic Mass, Periodic Table, Group, Period, Electron Dot Diagram	**Learning Targets**: Identify the names and symbols of common elements. Identify quarks as subatomic particles of matter. Describe the electron cloud model of the atom. Explain how electrons are arranged in an atom. Interpret the average atomic mass of an element. Explain the composition of the periodic table. Use the periodic table to obtain information. Explain what the terms: Metal, Non-Metal, Metalloid
Topic 1: **Trends of the Periodic Table**	**Length**: 2 weeks
Lesson Frame: Language of Chemistry	We will learn how subatomic particles can be traced to substances.
	I will understand the analogy letters, words, sentences, meanings.
Lesson Frame: How to read the Periodic Table	We will ID the trends of the periodic table.
	I will be able to locate characteristics and statistics of elements.
Lesson Frame: Atomic Structure	We will use trends of the periodic table to analyze atomic structure.
	I will be able to sketch then build a Bohr model of any element 1-18.
Performance Tasks: Organizing a Personal Periodic Table Building Bohr Models Predicting an Element's Group and Period	Notes:
Topic 2: **Atoms to Compounds**	**Length**: 2 weeks
Lesson Frame: Electron Configuration	We will evaluate the importance of valence electrons.

	I will be able to calculate electron numbers and locations via trends of the periodic table.
Lesson Frame: Bonding - Ionic vs. Covalent Molecule vs. Compound	We will compare and contrast types of bonding.
	I will ID types of bonds through the elements that bond easily and make simple compounds.
Lesson Frame: Balancing Equations 6 types of Chemical Reactions	We will learn the rule for balancing equations.
	I will balance notable chemical equations and classify the results as one of the 6 chemical reactions.
Performance Tasks: Gizmo Simulation Labs: https://www.explorelearning.com	Notes: List Chemical Reactions

Unit Name: **Diversity of Matter: *New Materials Through Chemistry***	**Length**: 4 weeks
Standards: HS-PS1-4 HS-PS2-6 HS-PS1-5 HS-PS1-5	**Outcomes:** Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
Essential Questions: How can metals vs. alloys characteristics be differentiated? Can you identify polymer vs. composite characteristics? What is the scientific, technological and economic importance of materials classified as metal, alloy, polymer, and composite? **Academic Vocabulary:** Metal, Malleable, Ductile, Metallic Bonding, Radioactive Element, Transition Element, Nonmetal, Sublimation, Metalloid, Allotrope, Transuranium Element, Alloy, Luster, Polymer, Monomer, Synthetic, Composite	**Learning Targets:** Describe the properties of a typical metal. Identify the alkali metals and alkaline earth metals. Differentiate among three groups of transition elements. Recognize hydrogen as a nonmetal. Compare and contrast properties of the halogens. Describe properties and uses of the noble gases. Distinguish among metals, nonmetals, and metalloids. Understand the importance of synthetic elements. Identify how different alloys are used. Explain how the properties of alloys determine their use. Identify what a polymer is and the variety of polymers around us. Compare and contrast soaps and detergents. Explain what a composite material is and why composites are used.
Topic 1: **Metals and Alloys**	**Length**: 2 weeks
Lesson Frame: Materials of the Past	We will research the history of various metals.
	I will build a working timeline for this chapter.
Lesson Frame: Observing Properties of Alloys	We will observe the bonding of metals.
	I will ID the thing that make substances like metal stronger and weaker.
Lesson Frame: Iron Age, Bronze age	We will continue to add to our timeline.
	I will be able to cite differences in the iron age vs. bronze age.
Performance Tasks: Building Timelines Metallic Glass - Enrichment Observing Properties of Alloys - Lab	Notes:

Topic 2: **Polymers and Composites**	**Length**: 2 weeks
Lesson Frame: Polymers	We will analyze the chemical components of polymers.
	I will ID and match various polymers to their subunits.
Lesson Frame: Composites	We will list the major differences between polymers and composites.
	I will show in a model specific examples contrasting and comparing polymers.
Lesson Frame: Versatile Materials	We will research examples of biomimicry relating to materials both natural and man-made.
	I will define and model biomimicry citing specific examples.
Performance Tasks: Natural vs. Synthetic Materials Technology Timelines for Ceramic/Glass and Polymer Composite Bowling Balls - History Pole Vaulting - History	Notes:

Unit Name: **Waves**	**Length:** 6 weeks
Standards: HS-ETS1-4 HS-ETS1-2 HS-ETS1-3 HS-PS1-8 (if the topic is chosen) HS-PS4-5 (if the topic is chosen) HS-PS4-1	**Outcomes:** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

Essential Questions: What is the connection with wave properties and anatomy to the senses, namely hearing and sight? **Academic Vocabulary:** Wave, Medium, Transverse Wave, Compressional Wave, Crests, Troughs, Rarefaction, Wavelength, Frequency, Period, Amplitude, Refraction, Diffraction, Interference, Standing Wave *Sound* - Resonance, Eardrum, Cochlea, Ossicles:, Intensity, Loudness, Decibel, Pitch, Doppler Effect, Music, Acoustics, Sonar *Light* - Opaque, Translucent, Transparent, Pigment, Coherent Light, Incoherent Light, Polarized Light	**Learning Targets:** Recognize that waves carry energy but not matter. Define mechanical waves. Compare and contrast transverse waves and compressional waves. Define wavelength, frequency, period, and amplitude. Describe the relationship between frequency and wavelength. Explain how a wave's energy and amplitude are related. Explain how sound travels through different mediums. Identify what influences the speed of sound. Describe how the ear enables you to hear. Recognize how amplitude, intensity, and loudness are related. Describe how sound intensity is measured and what levels can damage hearing. Explain the relationship between frequency and pitch. Discuss the Doppler effect. Distinguish between noise and music. Describe why different instruments have different sound qualities. Discuss the uses of sonar. Describe how light waves interact with matter. Define the index of refraction of a material. Explain why a prism separates white light into different colors. Explain how you see color. Explain how a laser produces coherent light. Distinguish polarized light from unpolarized light. Explain how a hologram is made. Describe the uses of optical fibers.
Topic 1: **Sound and Hearing**	**Length:** 3 weeks
Lesson Frame: Types of Waves, Anatomy of Waves	We will study the anatomical features of mechanical waves.
	I will be able to ID the major differences in Longitudinal waves and compressional waves.
Lesson Frame: Sound Through Mediums, Measuring Decibels	We will learn to calculate the characteristics of waves.
	I will learn and apply the formulas for frequency, amplitude, and wavelength to actual waves.
Lesson Frame: Anatomy and Physiology of the Ear	We will locate and function of the parts within the ear.
	I will know how sound waves react with the eardrum, ossicles, cochlea and auditory nerve.

Performance Tasks: Superposition Principle - Lab Resonance Tubes - Lab Breaking the Sound Barrier - Timeline Ultrasonic vs. Subsonic Simulating Hearing Loss - Lab Parts of the Outer, Middle and Inner Ear	Notes: Specialize communication and hearing. Match amplitude - decibel frequency - pitch wavelength - speed
Topic 2: **Light and Sight**	**Length**: 3 weeks
Lesson Frame: Behavior of Light	We will research statistics on light.
	I will know the speed of light and how travels through mediums.
Lesson Frame: Light and Color	We will analyze the electromagnetic spectrum (ROYGBIV).
	I will observe how we see and determine colors.
Lesson Frame: Anatomy and Physiology of the Eye	We will study the anatomy and physiology of the eye.
	I will know the difference between rods and cones (light and color detection cells on retina).
Performance Tasks: Observing Refraction - Lab Angles of Incidence and Reflection - Laser Lab Knowing the Color Wheel Complementary Color Logos- Who was Henri Matisse? Uses for Lightf: Polarization - Lasers/Barcodes - Fiber Optics Making Holograms	Notes:

September	October	November	December	January	February	March	April	May	June
Unit 1	Unit 2 cont.	Unit 4	Unit 5 cont	Rube Goldberg	Unit 6	Unit 7	Unit 8	Unit 9	
Unit 2	Unit 3	Unit 5		Semester 1 Final				Science Fair Project	
								Semester 2 Final	