Wyoming Department of Education
Required Virtual Education Course Syllabus

Washakie County School District # 1

Program Name	Washakie #1 Online	Content Area	SC
Course ID	WOL-SC8PSF1	Grade Level	8
Course Name	WOL-MS Physical Science	# of Credits	NA
SCED Code	NA	Curriculum Type	K12 Fuel Education

COURSE DESCRIPTION

This year-long K12 Physical Science course presents the fundamentals of physics and chemistry. Students explore the amazing universe we live in, including motion, energy, the nature of matter and atoms, how chemicals mix and react, and the forces that hold the universe together.

Among other subjects, students study:

- Structure of atoms
- Elements and the Periodic Table
- Chemical reactions
- Forces, including gravitational, motion, acceleration, and mass
- Energy, including light, thermal, electricity, and magnetism

Practical, hands-on lesson activities help students discover how scientists investigate the world of physical science. Students perform laboratory activities and a full-unit investigation to learn about the application of scientific methods.

WYOMING CONTENT AND PERFORMANCE STANDARDS	
STANDARD#	BENCHMARK (Standard/Indicator) Use the Standards and Benchmarks as Spreadsheets
MS-PS1-1	Develop models to describe the atomic composition of simple molecules and extended structures.
MS-PS1-2	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
MS-PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
MS-PS1-4	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
MS-PS1-5	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
MS-PS1-6	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
MS-PS2-1	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
MS-PS2-2	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
MS-PS2-3	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
MS-PS2-4	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
MS-PS2-5	Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
MS-PS3-1	Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

WYOMING CONTENT AND PERFORMANCE STANDARDS	
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MS-PS3-2	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
MS-PS3-3	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
MS-PS3-4	Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
MS-PS3-5	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
MS-PS4-1	Use mathematical representations to describe a simple model for waves, which includes how the amplitude of a wave is related to the energy in a wave.
MS-PS4-2	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
MS-PS4-3	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4	Develop a model for a proposed object, tool or process and then use an iterative process to test the model, collect data, and generate modification ideas trending toward an optimal design.
MS-ETS2-1	Ask questions about a common household appliance, collect data to reverse-engineer the appliance and learn how it's design has evolved, describe how scientific discoveries, technological advances, and engineering design played significant roles in its development, and explore how science, engineering and technology might be used together or individually in producing improved versions of the appliance.
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or Full opinions.
RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific Full scientific or technical context relevant to grades 6-8 texts and topics.
RST.6-8.5	Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
RST.6-8.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
RST.6-8.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
WHST.6-8.1.a	Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
WHST.6-8.1.b	Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
WHST.6-8.1.c	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
WHST.6-8.1.d	Establish and maintain a formal style.

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WHST.6-8.1.e	Provide a concluding statement or section that follows from and supports the argument presented.
WHST.6-8.2.a	Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
WHST.6-8.2.b	Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
WHST.6-8.2.c	Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
WHST.6-8.2.d	Use precise language and domain-specific vocabulary to inform about or explain the topic.
WHST.6-8.2.e	Establish and maintain a formal style and objective tone.
WHST.6-8.2.f	Provide a concluding statement or section that follows from and supports the information or explanation presented.
WHST.6-8.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.6-8.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
WHST.6-8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
WHST.6-8.10	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

SCOPE AND SEQUENCE		
UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/ STUDENT CENTERED GOALS
Unit 1: Introduction to Physical Science **Lesson 1: Introduction to Physical Science** **Lesson 2: Physical Systems** **Lesson 3: Measurement and the International System** **Lesson 4: Lab: Measured Steps** **Lesson 5: Lab: Density** **Lesson 6: Working with Model Problems** **Lesson 7: Model Problems** **Lesson 8: Unit Review** **Lesson 9: Unit Assessment**	RST.6-8.7	**Lesson 1: Introduction to Physical Science** Describe physical science as the study of matter and energy. **Lesson 2: Physical Systems** Describe how scientists use models to represent and predict real phenomena in the physical world. Recognize that models change to accommodate new discoveries and observations. Distinguish between a closed system and an open system. Define universal law and give an example. **Lesson 3: Measurement and the International System** Identify fundamental units of the SI and associate each unit with what it measures. Explain why scientists need a system of measurements. Measure physical quantities using the International System of Units (SI). **Lesson 4: Lab: Measured Steps** Draw conclusions based on the data recorded. Design an appropriate format to collect measurement data and to record the results of calculations. Measure and record data about physical objects. **Lesson 5: Lab: Density** Measure mass and volume of different substances.

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UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/ STUDENT CENTERED GOALS
		Given measurements of mass and volume, calculate the density of different substances. **Lesson 6: Working with Model Problems** Recognize the purpose and use of model problems in this course of study. **Lesson 7: Model Problems** Gain experience answering model problems related to topics of the previous lessons. **Lesson 8: Unit Review** Make measurements using the SI system. Differentiate different samples using factors such as density, size, and temperature. Describe and explain a model system physicists have used to represent a real phenomenon. **Lesson 9: Unit Assessment**
Unit 2: Matter **Lesson 1: Atoms** **Lesson 2: Atomic and Mass Numbers** **Lesson 3: Your Choice** **Lesson 4: Elements and the Periodic Table** **Lesson 5: Design of the Periodic Table** **Lesson 6: Molecules** **Lesson 7: Properties of Matter** **Lesson 9: Physical and Chemical Changes** **Lesson 10: Your Choice** **Lesson 11: Unit Review** **Lesson 12: Unit Assessment**	MS-PS1-1 MS-PS1-4 RST.6-8.4 RST.6-8.6	**Lesson 1: Atoms** Explain that all matter is made up of atoms. Describe one model structure of an atom as a nucleus made up of protons and neutrons, surrounded by electrons. Describe how and why models of the atom have changed over time. **Lesson 2: Atomic and Mass Numbers** Compare atomic number with the atomic mass of an element. Explain how an isotope of an element has the same number of protons but a different number of neutrons in the nucleus. Recognize that isotopes of an element typically have many similar characteristics. Define atomic number. **Lesson 3: Your Choice** Practice skills and reinforce concepts taught in this course. **Lesson 4: Elements and the Periodic Table** Explain how the arrangement of elements in the periodic table now reflects the number of protons and electrons in atoms. Describe the historical development of the periodic table, including Mendeleev's contributions, based on physical characteristics. Identify elements as the basic building blocks of matter. **Lesson 5: Design of the Periodic Table** Describe the design of the periodic table and explain how elements are grouped (e.g., families and periods). Interpret a diagram that displays information about a specific element (e.g., symbol, atomic number, name of element, and atomic mass. Identify areas of the periodic table that group metals, nonmetals, and inert gases. **Lesson 6: Molecules** Explain that a molecule is the smallest particle of a compound with all the properties of that substance. Define a molecule as two or more atoms that share electrons in a chemical bond. Describe chemical bonding as the formation of new substances through the combination of the atoms of specific elements. **Lesson 7: Properties of Matter** Give examples of physical properties of substances.

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		Give examples of chemical properties of substances. Differentiate physical and chemical properties of matter. **Lesson 8: States of Matter** Identify different states of matter. Describe how atoms and the arrangement of atoms contribute to the properties and states of matter. Explain how molecular motion differs in solids, liquids, and gases. **Lesson 9: Physical and Chemical Changes** Distinguish examples of physical and chemical changes. Differentiate physical changes from chemical changes, in terms of the molecular structure of a substance. Recognize that chemical reactions release or absorb heat. **Lesson 10: Your Choice** Practice skills and reinforce concepts taught in this course. **Lesson 11: Unit Review** Describe the structure of an atom, of an element, and its isotopes. Describe six properties of matter. Explain how the motion of molecules differs in different states of matter. Describe the patterns of organization represented in the periodic table. Distinguish between physical changes and chemical changes. **Lesson 12: Unit Assessment**
Unit 3: Chemistry **Lesson 1: Chemical Bonding** **Lesson 2: Chemical Reactions** **Lesson 3: Chemical Formulas** **Lesson 4: Lab: Testing and Producing Gases** **Lesson 5: Rates of Chemical Reactions** **Lesson 6: Chemical Equations** **Lesson 7: Your Choice** **Lesson 8: Lab: Dissolving Metals** **Lesson 9: Mixtures** **Lesson 10: Separating Mixtures** **Lesson 11: Solutions** **Lesson 12: Substances** **Lesson 13: Lab: Separating Ingredients** **Lesson 14: Acids and Bases** **Lesson 15: Your Choice** **Lesson 16: Model Problems** **Lesson 17: Unit Review** **Lesson 18: Unit Assessment**	MS-PS1-4 MS-PS1-2 MS-PS1-6 RST.6-8.5 WHST.6-8.1.a WHST.6-8.1.b WHST.6-8.1.c WHST.6-8.1.d WHST.6-8.1.e WHST.6-8.10	**Lesson 1: Chemical Bonding** Describe how the arrangement of electrons affects the formation of ionic and covalent compounds. Explain how compounds are formed by combining two or more different elements. Recognize that the properties of compounds differ from their constituent elements and provide examples. **Lesson 2: Chemical Reactions** Explain that energy is always involved in chemical reactions either as absorption or release of heat. Describe how chemical reactions involve breaking and reforming bonds (either ionic or covalent). Explain how reactants enter into chemical reactions that result in products. Recognize that chemical reactions may involve the formation of a precipitate, the generation of gas, or a change in color. **Lesson 3: Chemical Formulas** Compare ionic and covalent compounds and their molecular formulas. Identify various compounds by their chemical formulas. Explain and give examples of how chemical formulas can express chemical reactions. **Lesson 4: Lab: Testing and Producing Gases** Explain that reactions occur at different rates and that reaction rates can change. **Lesson 5: Rates of Chemical Reactions** Describe factors that influence the rate of reactions (e.g., changing the concentration of reactants, changing the surface area of solids, or using a catalyst). Provide examples that illustrate different reaction rates.

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UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/ STUDENT CENTERED GOALS
		Explain that chemical reactions occur at different rates. **Lesson 6: Chemical Equations** Describe a chemical reaction using a chemical equation. Explain "conservation of mass" in chemical reactions. **Lesson 7: Your Choice** Practice skills and reinforce concepts taught in this course. **Lesson 8: Lab: Dissolving Metals** Draw conclusions based on the results of an investigation. Collect pertinent data from a scientific investigation to test a hypothesis or provide information. **Lesson 9: Mixtures** Explain that the properties of a substance or mixture depend on the properties, motions, and interaction of its molecules. Define homogeneous mixtures and heterogeneous mixtures, and recognize examples of each. Given a list of common substances and chemical formulas, classify matter as elements, compounds, or mixtures. **Lesson 10: Separating Mixtures** Explain how mixtures can be separated by physical methods, such as mixing, magnetic attraction, evaporation, filtration, distillation, chromatography, and settling. Interpret diagrams with examples of these methods of forming and separating mixtures. **Lesson 11: Solutions** Define and differentiate solvent, solute, and solution. Interpret data presented in solubility graphs and explain the effect of different variables on solubility rates. **Lesson 12: Substances** Given a list of common substances and/or chemical formulas, classify matter as elements, molecules, compounds, solutions, or mixtures Compare mixtures and solutions. **Lesson 13: Lab: Separating Ingredients** Investigate techniques for separating mixtures. **Lesson 14: Acids and Bases** Define pH and explain how it is determined. Recognize and label common acids and bases. Compare properties of acids and bases. Determine whether a given solution is acidic, basic, or neutral. **Lesson 15: Your Choice** Practice skills and reinforce concepts taught in this course. **Lesson 16: Model Problems** Gain experience answering model problems related to topics of the previous lessons. **Lesson 17: Unit Review** Explain how chemical reactions occur. Balance chemical equations and explain what it means to balance such an equation. Interpret graphs showing the rates of chemical reactions. Compare the chemistry of acids and bases. Compare the chemistry of ionic and covalent bonds. Explain what is modeled by a chemical formula.

SCOPE AND SEQUENCE		
UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/ STUDENT CENTERED GOALS
		Lesson 18: Unit Assessment
Unit 4: Force and Motion **Lesson 1: Force** **Lesson 2: Gravitational Force** **Lesson 3: Motion** **Lesson 4: Calculating Speed** **Lesson 5: Speed and Velocity** **Lesson 6: Measuring Speed and Velocity** **Lesson 7: Reverse Engineering (Add On Unit)** **Lesson 8: Acceleration** **Lesson 9: Newton's First Law of Motion** **Lesson 10: Mass and Weight** **Lesson 11: Newton's Second Law of Motion** **Lesson 12: Newton's Third Law of Motion** **Lesson 13: Buoyant Forces** **Lesson 14: Lab: Precious Cargo** **Lesson 15: Your Choice** **Lesson 16: Model Problems** **Lesson 17: Unit Review** **Lesson 18: Unit Assessment**	MS-PS2-1 MS-PS2-2 MS-PS2-4 MS-ETS2-1 RST.6-8.9 RST.6-8.10	**Lesson 1: Force** Interpret a diagram to describe the forces acting on a specific object and their cumulative effect. Define force as a push or a pull that can cause an object to move, stop moving, change speed, or change direction. Explain that a force has direction and strength (magnitude). Recognize that an object at rest, upon which balanced forces are acting, will not change its state of motion. Identify a variety of forces such as gravity, magnetism, friction, spring, and electrical. **Lesson 2: Gravitational Force** Apply Newton's Law of Universal Gravitation to explain how gravity acts upon all objects in the universe. Define gravity as a universal force that every mass exerts on every other mass. Explain that the weight of objects varies at different locations in the universe, due to differences in gravitational force; the mass of objects remains constant. Describe fundamental notions of how scientists think gravity shaped planets, stars, and solar systems. **Lesson 3: Motion** Interpret diagrams that represent motion. Explain that motion is established with respect to a frame of reference. Define motion as a change in position within a certain amount of time. Explain that the motion of an object can be described according to its position, direction, and speed. **Lesson 4: Calculating Speed** Design an experiment to test a hypothesis or to gather information; state the purpose of the experiment. **Lesson 5: Speed and Velocity** Define speed as the distance an object has traveled divided by time. Solve problems about speed. Define velocity as the speed of an object in a certain direction. Interpret information about speed and velocity presented in tables and graphs. **Lesson 6: Measuring Speed and Velocity** Explain that velocity in one dimension may be positive or negative while speed always has a positive value. Solve problems about speed and velocity using graphs, drawings, and computation. **Lesson 7: Reverse Engineering** Student will determine how to improve, change, modify an existing product that will benefit society. Determine how the modified product would benefit, or potentially harm, society. Student will examine both the pros and cons of their modifications to examine incidental benefit/incidental harm. **Lesson 8: Acceleration** For motion in one dimension, distinguish among positive, negative, and no acceleration.

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UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/ STUDENT CENTERED GOALS
		Define acceleration as the rate of change of velocity. Explain that changes in velocity may be caused by changes in speed and direction. **Lesson 9: Newton's First Law of Motion** Recognize that when forces remain balanced, the velocity of an object will remain constant, and when the forces are unbalanced, the velocity of an object will change. Explain Newton's First Law of Motion. Describe situations that demonstrate Newton's First Law of Motion. **Lesson 10: Mass and Weight** Describe an object's mass as the quantity of matter it contains (measured in kg or g). Describe the weight of an object as the magnitude of the earth's gravitational force acting upon it. Explain that the greater the mass of an object, the more force is needed to change its velocity. **Lesson 11: Newton's Second Law of Motion** Solve problems using the formula F = ma. Explain that the acceleration of an object depends on its mass and the total amount of force applied to it. Explain Newton's Second Law of Motion. Define acceleration as a change in velocity per unit of time. **Lesson 12: Newton's Third Law of Motion** Explain Newton's Third Law of Motion. Apply Newton's three laws of motion in real-world situations, such as sports activities and transportation. Interpret diagrams that demonstrate applications of Newton's Third Law. **Lesson 13: Buoyant Forces** Explain that the buoyant force on an object is equal to the weight of the fluid that the object displaces. Apply the principle of buoyant force to predict whether objects will float or sink in a fluid. Explain that an object floats when its density is less than the density of the fluid surrounding it. **Lesson 14: Lab: Precious Cargo** Apply Newton's Laws of Motion in hands-on activities. **Lesson 15: Your Choice** Practice skills and reinforce concepts taught in this course. **Lesson 16: Model Problems** Gain experience in answering model problems related to topics of the previous lessons. **Lesson 17: Unit Review** Apply mathematical solutions to solve problems involving speed and velocity of objects. Apply Newton's Laws to solve motion-related problems. Apply Newton's Universal Law of Gravitation to explain how gravity acts upon all objects in the universe. **Lesson 18: Unit Assessment**
Unit 5: Semester 1 Assessment **Lesson 1: Semester 1 Review**		**Lesson 1: Semester 1 Review** Make measurements using the SI system. Describe the patterns of organization represented in the periodic table.

SCOPE AND SEQUENCE		
UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/ STUDENT CENTERED GOALS
Lesson 2: Semester 1 Assessment		Explain how the motion of molecules differs in different states of matter. Describe how scientists use models to represent and predict real phenomena in the physical world. Explain that energy is always involved in chemical reactions either as absorption of heat (endothermic) or release of heat (exothermic). Compare the chemistry of ionic and covalent bonds. Apply Newton's Laws to solve motion-related problems. Describe the structure of an atom, of an element, and its isotopes. Balance chemical equations and explain what it means to balance such an equation. **Lesson 2: Semester 1 Assessment**
Unit 6: Energy **Lesson 1: Energy** **Lesson 2: Work** **Lesson 3: Kinetic Energy** **Lesson 4: Potential Energy** **Lesson 5: Lab: The Pendulum** **Lesson 6: Your Choice** **Lesson 7: Using a Lever** **Lesson 8: Simple Machines** **Lesson 9: Compound Machines** **Lesson 10: Lab: Heat Flow** **Lesson 11: Thermal Energy** **Lesson 12: Temperature** **Lesson 13: Your Choice** **Lesson 14: Model Problems** **Lesson 15: Unit Review** **Lesson 16: Unit Assessment**	MS-PS1-5 MS-PS3-1 MS-PS3-2 MS-PS3-3 MS-PS3-5 MS-ETS1-2 RST.6-8.4 WHST.6-8.1.a WHST.6-8.1.b WHST.6-8.1.c WHST.6-8.1.d WHST.6-8.1.e WHST.6-8.2.a WHST.6-8.2.b WHST.6-8.2.c WHST.6-8.2.d WHST.6-8.2.e WHST.6-8.2.f WHST.6-8.4 WHST.6-8.5 WHST.6-8.6 WHST.6-8.7 WHST.6-8.8 WHST.6-8.9 WHST.6-8.10	**Lesson 1: Energy** Define energy as the ability to do work. Give examples of different forms of energy used in everyday life. Identify joules as the unit of measure for energy. Explain that energy cannot be created or destroyed, but it can be transformed. Apply knowledge of energy to explain examples of energy conversion. **Lesson 2: Work** Describe power as the rate at which work is done, or energy used or created per unit time, expressed in watts (W). Solve problems using equations for work and power. Define work as applied force that acts upon an object over a distance. **Lesson 3: Kinetic Energy** Define kinetic energy and give examples. Identify the points at which a moving object has the most and least kinetic energy (e.g., pendulum swing, falling objects). Explain how kinetic energy is related to the velocity of an object and the forces acting on an object. **Lesson 4: Potential Energy** Give examples of how potential energy can be converted to kinetic energy. Analyze and compare potential and kinetic energy at various locations or times (e.g., roller coaster, waterfall). Describe potential energy and give examples. Analyze and compare potential and kinetic energy at various locations or times (e.g., roller coaster, waterfall). **Lesson 5: Lab: The Pendulum** Identify the points at which a moving object has the most potential and/or kinetic energy (e.g., pendulum swing, falling objects). Identify independent variables, dependent variables, constants, and controls. Write an organized, orderly, step-by-step procedure describing how to perform a science investigation of choice. Formulate hypotheses based on an understanding of cause-and-effect relationships. Design an experiment to test a hypothesis or to gather information; state the purpose of the experiment. Draw conclusions based upon the results of an investigation. **Lesson 6: Your Choice** Practice skills and reinforce concepts taught in this course.

SCOPE AND SEQUENCE		
UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/ STUDENT CENTERED GOALS
		Lesson 7: Using a Lever Recognize that levers confer mechanical advantage and explain how this principle applies to the musculoskeletal system. Given a simple machine, predict what will happen when there is a change in the system. **Lesson 8: Simple Machines** Identify six simple machines (lever, pulley, wheel and axle, inclined plane, wedge, screw) and tell how they work. Explain that simple machines are used to make work easier by changing the direction or size of a force. Provide examples of simple machines used in everyday tools and objects. **Lesson 9: Compound Machines** Identify the simple machines that are combined in a compound machine. Compare and contrast a simple machine and a compound machine. **Lesson 10: Lab: Heat Flow** Compare and contrast the transfer of thermal energy through radiation, convection, or conduction. Describe how thermal energy flows from a system of higher temperature to a system of lower temperature. **Lesson 11: Thermal Energy** Compare and contrast the transfer of thermal energy through radiation, convection, or conduction. Describe how thermal energy flows from a system of higher temperature to a system of lower temperature. Recognize that changes in the temperature of an object will affect the kinetic energy of that object. **Lesson 12: Temperature** Explain that changes in the position and motion of atoms in a solid, liquid, or gas are the result of temperature increase or decrease. Describe the differences between thermal energy, kinetic energy, potential energy, and temperature. Explain how the kinetic energy of atoms or molecules of different objects varies with their temperature. **Lesson 13: Your Choice** Practice skills and reinforce concepts taught in this course. **Lesson 14: Model Problems** Gain experience answering model problems related to topics of the previous lessons. **Lesson 15: Unit Review** Define and apply concepts of work and power. Apply the law of conservation of energy to solve problems involving changes of energy. Compare and contrast the concepts of thermal energy, heat, and temperature. Show how simple machines reduce the force necessary to perform a task. Compare and contrast kinetic and potential energy and solve problems involving them. **Lesson 16: Unit Assessment**

SCOPE AND SEQUENCE		
UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/ STUDENT CENTERED GOALS
Unit 7: Waves, Sound, and Light **Lesson 1: Waves** **Lesson 2: Electromagnetic Waves** **Lesson 3: Light Waves** **Lesson 4: Lab: Path of Light** **Lesson 5: Analog and Digital Signals (Add On Module)** **Lesson 6: Reflection and Refraction** **Lesson 7: Lenses** **Lesson 8: Model Problems** **Lesson 9: Unit Review** **Lesson 10: Unit Assessment**	MS-PS4-1 MS-PS4-2 MS-PS4-3 RST.6-8.1 RST.6-8.2 RST.6-8.7 RST.6-8.8 RST.6-8.9 WHST.6-8.1.a WHST.6-8.1.b WHST.6-8.1.c WHST.6-8.1.d WHST.6-8.1.e	**Lesson 1: Waves** Describe a mechanical wave as a disturbance that travels through a medium. Describe how energy can be transferred through a wave, and explain the relationship between the energy of a wave and its frequency. Define the wavelength, amplitude, and frequency of a wave. Explain that energy moves from one place to another through heat flow, waves, or moving objects. **Lesson 2: Electromagnetic Waves** Recognize that the sun's radiation consists of a wide range of wavelengths, mainly visible light and infrared and ultraviolet radiation. Explain that human eyes respond to a narrow range of wavelengths within the electromagnetic spectrum (red through violet) called visible light. Compare electromagnetic waves with mechanical waves. **Lesson 3: Light Waves** Explain that light travels in straight lines (when the medium is kept constant). Explain why retinal cells and plant leaves react differently to various wavelengths. Describe white light as a mixture of different wavelengths (colors). **Lesson 4: Lab: Path of Light** Explain that light travels in straight lines (when the medium is kept constant). **Lesson 5: Analog and Digital Signals (Add On Module)** Explain that digital signals are made with pulses while analog signals are continuous. Explain that in analog technology, a wave is recorded or used in its original form. Explain that in digital technology, the analog wave is sampled at some interval, and then turned into numbers that are stored in a digital devise. Explain that in digital technology recordings do not degrade over time. Describe specific feathers that make digital transmission of signals more reliable than analog transmission of signals. Describe at least one technology that uses digital encoding and transmission of information. Gather sufficient evidence to support a claim about a phenomenon that includes the idea that using waves to carry digital signals is a more reliable way to encode and transmit information than using waves to carry analog signals. **Lesson 6: Reflection and Refraction** Interpret a diagram showing how the angle of reflection is equal to the angle of incidence of a beam of light. Explain and give examples of how light can be reflected, refracted, transmitted, and absorbed by matter. Describe how refraction can separate white light. **Lesson 7: Lenses** Explain various uses of lenses (e.g., in the human eye, a magnifying glass, camera, telescope, and microscope). Describe the difference between convex and concave lenses and their different effects on images. **Lesson 8: Model Problems**

SCOPE AND SEQUENCE		
UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/ STUDENT CENTERED GOALS
		Gain experience answering model problems related to topics of the previous lessons. **Lesson 9: Unit Review** Explain how light can be reflected, refracted, transmitted, and absorbed by matter and provide examples. Describe the difference between convex and concave lenses. Compare electromagnetic waves with mechanical waves. Describe white light as a mixture of different wavelengths (colors). **Lesson 10: Unit Assessment**
Unit 8: Electricity and Magnetism 1 **Lesson 1: Electric Charge** **Lesson 2: Electric Currents** **Lesson 3: Electric Circuits** **Lesson 4: Your Choice** **Lesson 5: Lab: Series and Parallel Circuits** **Lesson 6: Magnetism** **Lesson 7: Electricity and Magnetism** **Lesson 8: Lab: Motoring On!** **Lesson 9: Motors and Generators** **Lesson 10: Model Problems** **Lesson 11: Your Choice** **Lesson 12: Unit Review** **Lesson 13: Unit Assessment**	MS-PS1-3 MS-PS2-3 MS-PS2-5 RST.6-8.10 WHST.6-8.2.a WHST.6-8.2.b WHST.6-8.2.c WHST.6-8.2.d WHST.6-8.2.e WHST.6-8.2.f WHST.6-8.4 WHST.6-8.6 WHST.6-8.7 WHST.6-8.8 WHST.6-8.9 WHST.6-8.10	**Lesson 1: Electric Charge** Describe how charged objects experience forces of attraction or repulsion. Explain that objects become electrically charged when they gain or lose electrons. Describe the area where one or more charged particles exert a force on another charge as an electric field. **Lesson 2: Electric Currents** Define electric current and electricity as a flow of charged particles (such as the flow of electrons in a wire). Explain how electric resistance affects current. Identify materials as conductors or insulators of the flow of electricity. **Lesson 3: Electric Circuits** Describe an electric circuit as a complete closed path for an electric current. Analyze and label the parts of an electric circuit. Interpret and compare diagrams of open and closed electric circuits, including series and parallel circuits. Explain how electric current flows in series and parallel circuits and describe the advantages and disadvantages of each type of circuit. Explain how electric resistance affects current. **Lesson 4: Your Choice** Practice skills and reinforce concepts taught in this course. **Lesson 5: Lab: Series and Parallel Circuits** Explain how electric current flows in series and parallel circuits and describe the advantages and disadvantages of each type of circuit. Interpret and compare diagrams of open and closed electric circuits, including series and parallel circuits. Analyze and label the parts of an electric circuit. Create parallel and series electric circuits. **Lesson 6: Magnetism** Explain a diagram that shows the lines of force in a magnetic field. Identify materials that are magnetic. Compare a magnetic field with an electrical field. **Lesson 7: Electricity and Magnetism** Explain how a magnetic field can be created by an electric current flowing in a wire. Describe how different variables influence the strength of an electromagnet. **Lesson 8: Lab: Motoring On!** Create an electric motor.

SCOPE AND SEQUENCE		
UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/ STUDENT CENTERED GOALS
		Lesson 9: Motors and Generators Explain how generators convert mechanical energy into electrical energy. Describe how an electric current is created when a circuit is exposed to a changing magnetic field. **Lesson 10: Model Problems** Gain experience answering model problems related to topics of the previous lessons. **Lesson 11: Your Choice** Practice skills and reinforce concepts taught in this course. **Lesson 12: Unit Review** Explain that objects become electrically charged when they gain or lose electrons. Explain how electrical resistance affects current. Explain how electromagnets work. Recognize that a changing magnetic field can induce a current in a conductor. Explain the source of magnetic fields. Identify materials that are magnetic. Compare and contrast open and closed series circuits and parallel circuits. **Lesson 13: Unit Assessment**
Unit 9: Semester 2 Assessment **Lesson 1: Semester 2 Review** **Lesson 2: Semester 2 Assessment**		**Lesson 1: Semester 2 Review** Compare electromagnetic waves with mechanical waves. Explain how light can be reflected, refracted, transmitted, and absorbed. Compare and contrast open and closed series circuits and parallel circuits. Apply concepts of work, power, and the law of conservation of energy to solve problems. Compare and contrast different forms of energy, including kinetic, potential, thermal, and electromagnetic. **Lesson 2: Semester 2 Assessment**
Lab Appendix	MS-PS1-4 MS-PS1-2 MS-PS2-1 MS-PS2-5 MS-PS3-3 MS-PS3-4 MS-PS4-2 MS-ETS1-1 MS-ETS1-3 MS-ETS1-4 RST.6-8.3	**Lab 1: Heat Flow** Students complete a hands-on investigation to observe how thermal energy is transferred from one substance to another. **Lab 2: Testing and Producing Gases/Separating Ingredients** Students experiment with different types of chemical reactions and complete a simple distillation of common beverages. **Lab 3: Precious Cargo** Students complete a hands-on investigation designing cushioning for precious cargo in a vehicle. **Lab 4: Motoring On!** Students build a simple electromagnetic motor to understand electric and magnetic fields. **Lab 5: Heat Flow** Students complete a hands-on lab examining heat flow from a metal pot to water and record their results. **Lab 6: Path of Light** Students complete a hands-on investigation studying how a path of light changes when it reaches a shiny surface.

SCOPE AND SEQUENCE		
UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/ STUDENT CENTERED GOALS
		Lab 6: The Pendulum Students build and manipulate a pendulum and test factors that determine the motion of its swing, including how to change the mass to affect its swing.