Wyoming Department of Education Required Virtual Education Course Syllabus

Niobrara County School District # 1

Program Name	Wyoming Virtual Academy	Content Area	SC
Course ID	D-SCI-08BV1-K	Grade Level	8
Course Name	Middle School Physical Science- Sem2	# of Credits	
SCED Code		Curriculum Type	K12 Inc

COURSE DESCRIPTION

The K12 Physical Science program introduces students to many aspects of the physical world, focusing first on chemistry and then on physics. The course provides an overview of the physical world and gives students tools and concepts to think clearly about atoms, molecules, chemical reactions, motion, electricity, light, and other aspects of chemistry and physics. Among other subjects, students study the structure of atoms; the elements and the Periodic Table; chemical reactions; forces, including gravitational, motion, acceleration, and mass; and energy, including light, thermal, electricity, and magnetism.

WYOMING CONTENT AND PERFORMANCE STANDARDS

STANDARD#	BENCHMARK (Standard/Indicator) Use the Standards and Benchmarks as Spreadsheets
8.1.12	Forms and Uses of Energy: Students investigate energy as a property of substances in a variety of forms with a range of uses.
8.1.13	The Conservation of Matter and Energy: Students identify supporting evidence to explain conservation of matter and energy, indicating that matter or energy cannot be created or destroyed but is transferred from one object to another.
8.2.1	Students research scientific information and present findings through appropriate means.
8.2.2	Students use inquiry to conduct scientific investigations. • Ask questions that lead to conducting an investigation. • Collect, organize, and analyze and appropriately represent data. • Draw conclusions based on evidence and make connections to applied scientific concepts. • Clearly and accurately communicate the result of the investigations.
8.2.4	Students recognize the relationship between science and technology in meeting human needs.

SCOPE AND SEQUENCE

UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/STUDENT CENTERED GOALS
Module 1: Work and Machines Lesson 1.01: Work and Machines	8.1.12,	Define energy as the ability to do work. Define work as applied force that acts upon an object over a distance. Describe power as the rate at which work is done, or energy used or created per

		unit time, expressed in watts. (W). Identify and describe the units of measurement, and their symbols, for work and power. Solve problems using equations for work and power. Understand the formula for work and power and how to solve for any of the three variables when the other two are given.
Module 1: Work and Machines Lesson 1.02: Work and Power Math	8.1.12,	Define energy as the ability to do work. Define work as applied force that acts upon an object over a distance. Describe power as the rate at which work is done, or energy used or created per unit time, expressed in watts. (W). Identify and describe the units of measurement, and their symbols, for work and power. Solve problems using equations for work and power. Understand the formula for work and power and how to solve for any of the three variables when the other two are given.
Module 1: Work and Machines Lesson 1.03: Simple Machines	8.1.12,	Explain input force and output force. Explain that simple machines are used to make work easier by changing the direction or size of a force. Identify six simple machines (lever, pulley, wheel and axle, inclined plane, wedge, screw) and tell how they work. Provide examples of simple machines used in everyday tools and objects.
Module 1: Work and Machines Lesson 1.04: Compound Machines	8.1.12,	Compare and contrast a simple machine and a compound machine. Identify the simple machines that are combined in a compound machine.
Module 1: Work and Machines Lesson 1.05: Work and Changes in Energy	8.1.12,	Define energy as the ability to do work. Describe what happens to the energy of an object when work occurs. Solve problems using equations for work and power.
Module 1: Work and Machines Lesson 1.06: Kinetic Energy	8.1.12,	Define kinetic energy and give examples. Explain how kinetic energy is related to mass and speed. Explain how kinetic energy is related to the velocity of an object and the forces acting on an object. Identify the points at which a moving object has the most and least kinetic energy (e.g., pendulum swing, falling objects).
Module 1: Work and Machines Lesson 1.07: Potential Energy	8.1.12,	Analyze and compare potential and kinetic energy at various locations or times (e.g., roller coaster, waterfall). Describe and apply the formula for gravitational potential energy. Describe potential energy and give examples. Describe the different types of potential energy. Give examples of how potential energy can be converted to kinetic energy.
Module 1: Work and Machines Lesson 1.08: KE and PE Math	8.1.12,	Apply the kinetic energy and potential energy formulas and understand how to solve for missing variables when other information/variables is given. Describe and apply the formula for gravitational potential energy.
Module 1: Work and Machines Lesson 1.08: KE and PE Math (cont.)		

Module 1: Work and Machines Lesson 1.09: Mechanical Energy Conservation	8.1.12, 8.1.13,	Analyze a physical situation and identify whether the total mechanical energy of an object is increasing, decreasing or remaining constant. Define mechanical energy and relate it to the amount of kinetic energy and potential energy. Identify the conditions in which mechanical energy is not conserved and demonstrate an understanding of the distinction between energy conservation and non-conservation. Predict whether an object's total mechanical energy would be conserved or not conserved based upon the types of forces which are doing work upon the object.
Module 1: Work and Machines Lesson 1.10: Conservation of Energy Math	8.1.12,	Analyze a physical situation and identify whether the total mechanical energy of an object is increasing, decreasing or remaining constant. Define mechanical energy and relate it to the amount of kinetic energy and potential energy. Identify the conditions in which mechanical energy is not conserved and demonstrate an understanding of the distinction between energy conservation and non-conservation. Predict whether an object's total mechanical energy would be conserved or not conserved based upon the types of forces which are doing work upon the object.
Module 1: Work and Machines Lesson 1.11: Module Review		
Module 1: Work and Machines Lesson 1.11: Module Review (cont.)		
Module 1: Work and Machines Lesson 1.12: Module Exam		
Module 1: Work and Machines Lesson 1.12: Module Exam (cont.)		
Module 2: Energy Lesson 2.01: Energy	8.1.13,	Apply knowledge of energy to explain examples of energy conversion. 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. Explain that energy cannot be created or destroyed, but it can be transformed. Give examples of different forms of energy used in everyday life. Identify joules as the unit of measure for energy.
Module 2: Energy Lesson 2.02: Thermal Energy	8.1.13, 8.1.12,	Compare and contrast the transfer of thermal energy through radiation, convection, or conduction. Define and explain thermal equilibrium. Describe how thermal energy flows from a system of higher temperature to a system of lower temperature. Describe the kinetic theory of heat. Recognize that changes in the temperature of an object will affect the kinetic energy of that object.

Module 2: Energy Lesson 2.03: Temperature and Heat	8.1.13, 8.1.12,	Describe the differences between thermal energy, kinetic energy, potential energy, and temperature. Explain and apply how to mathematically convert Fahrenheit to Celsius and Celsius to Fahrenheit. Explain how the kinetic energy of atoms or molecules of different objects varies with their 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. Explain the relationship between Kelvin, Celsius, and Fahrenheit temperature scales.
Module 2: Energy Lesson 2.04: First Law of Thermodynamics	8.1.13,	Explain the first law of thermodynamics by analyzing the equation that defines it. Explain the relationship between the law of conservation of energy and the first law of thermodynamics. Solve problems involving the first law of thermodynamics.
Module 2: Energy Lesson 2.05: Steam and Engines	8.1.12, 8.2.1, 8.2.2, 8.2.4	Describe reasons why alternatives for gasoline engines are being considered. Describe the basic principles of operation of hybrid vehicles, and the different types of hybrid vehicles. Explain the basic principles of gasoline engines as propulsion for vehicles, and list the pros and cons associated with gasoline engines. Explain the pros and cons associated with hybrid vehicles.
Module 2: Energy Lesson 2.05: Steam and Engines (cont.)		
Module 2: Energy Lesson 2.06: Fossil Fuels	8.1.12, 8.2.4	Describe the basic scientific and technical principles behind large-scale applications of renewable energy. Explain the difference between renewable and nonrenewable energy sources. Explain the pros and cons of different renewable energy sources. Identify a wide variety of applications for renewable energy. Identify and distinguish between different forms of renewable energy.
Module 2: Energy Lesson 2.06: Fossil Fuels (cont.)		
Your Choice (Can use optional lab or discussions)		
Module 2: Energy Lesson 2.07: Hybrid Vehicles	8.1.12, 8.2.4	Define nuclear energy as the energy contained in the in the nucleus of an atom. Describe how heat, light mechanical motion, or electricity might all be involved in nuclear reaction energy transfers. Describe how nuclear energy is commonly used in reactors to produce heat, which can then be used to generate electricity. Explain how in most nuclear reactions, energy is transferred into or out of a system.
Module 2: Energy Lesson 2.08: Solar and Wind Energy	8.1.13,	Recognize the importance of photosynthesis in using light energy as part of the chemical process that builds plant materials. Trace the path of

		energy from the sun to mechanical energy in an organism
Module 2: Energy Lesson 2.09: Nuclear Energy	8.1.12, 8.1.13,	Explain how respiration in animals is a process that converts food energy into mechanical and heat energy. Explain that food energy can be measured and that the calorie is the unit of energy used for determining energy in the foods we eat. Relate calories to other units of energy measurement and see how conservation of energy may be quantified. Trace the path of energy from the sun to mechanical energy in an organism
Module 2: Energy Lesson 2.09: Nuclear Energy (cont.)		
Module 2: Energy Lesson 2.10: Plants and Photosynthesis	8.1.12, 8.1.13,	Explain how respiration in animals is a process that converts food energy into mechanical and heat energy. Explain that food energy can be measured and that the calorie is the unit of energy used for determining energy in the foods we eat. Relate calories to other units of energy measurement and see how conservation of energy may be quantified. Trace the path of energy from the sun to mechanical energy in an organism
Module 2: Energy Lesson 2.11: Chemical Energy in Food		
Module 2: Energy Lesson 2.12: The Body and Its Energy		
Module 2: Energy Lesson 2.13: Module Review		
Module 2: Energy Lesson 2.13: Module Review (cont.)		
Module 2: Energy Lesson 2.14: Module Exam		
Module 2: Energy Lesson 2.14: Module Exam		
Module 3: Mechanical Waves Lesson 3.01 Mechanical Waves	8.1.12,	Compare and contrast the different types of mechanical waves. Define the wavelength, amplitude, and frequency of a wave. Define transverse, longitudinal, and surface 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. Explain that energy moves from one place to another through heat flow, waves, or moving objects.
Module 3: Mechanical Waves Lesson 3.02: Search for Mechanical Waves	8.1.12,	

Module 3: Mechanical Waves Lesson 3.03: Transverse and Longitudinal	8.1.12,	Compare and contrast the properties of transverse and longitudinal waves. Describe how transverse and longitudinal waves can combine to form surface waves. Explain how a transverse waves can be demonstrated through a Slinky.
Module 3: Mechanical WavesLesson 3.04: Waves Math	8.1.12,	Apply the formula for wave speed to solve for the missing varaible in the formula when two of the other pieces of information are given. Apply the formula for wave speed, involving the wavelength, period, and frequency variables to calculate wave speed.
Module 3: Mechanical Waves Lesson 3.04: Waves Math (cont.)		
Module 3: Mechanical Waves Lesson 3.05: Seismic Waves	8.1.12,	Compare and contrast different types of seismic waves. Describe how seismic waves are produced and travel outward from the earthquake focus. Explain how scientists infer that the Earth has internal layers with discernible properties using patterns of primary (P) and secondary
Module 3: Mechanical Waves Lesson 3.05: Seismic Waves (cont.)		
Your Choice (Can use optional lab or discussions)		
Module 3: Mechanical Waves Lesson 3.06: Interference and Diffraction	8.1.12,	
Module 3: Mechanical Waves Lesson 3.07: How Your Ear Works	8.1.12,	Describe the basic structures of the external, middle and inner ear. Explain how humans (and other organisms) hear sounds. Explain that when a vibration travels through the air and into the ear canal it vibrates the eardrum, and describe that the vibration of vocal chords creates our voice.
Module 3: Mechanical Waves Lesson 3.08: Natural Frequency and Resonance	8.1.12,	Describe real-world examples to which the understanding of resonance could be applied and explain why. Explain the conditions required for resonance. Identify/explain the variables that affect natural frequency.
Module 3: Mechanical Waves Lesson 3.09: Sound Waves Math	8.1.12,	Apply the formula for wave speed to solve for the missing varaible in the formula when two of the other pieces of information are given. Apply the formula for wave speed, involving the wavelength, period, and frequency variables to calculate wave speed.
Module 3: Mechanical Waves Lesson 3.09: Sound Waves Math (cont.)		
Module 3: Mechanical Waves Lesson 3.10: What Is Frequency	8.1.12,	Define the frequency of a wave is the count of either the number of crests or the number of troughs that pass a point in a given amount of time. Describe real-world frequencies that most humans experience each day. Draws connections between the topic of the discussion and larger themes Examine views of others and revise own

		views if warranted. Explain how the frequency of a wave relates to its energy. Use technology to collaborate with peers by publishing writing which links and cites sources.
Module 3: Mechanical Waves Lesson 3.11: Ultrasound and Infrasound	8.1.12,	Define ultrasound and infrasound waves. Draws connections between the topic of the discussion and larger themes Examine views of others and revise own views if warranted. Explain how some animals hear frequencies that are too high-pitched or low-pitched for human hearing. Explain how some medical equipment uses ultrasound to diagnose unseen body conditions or injury. Use technology to collaborate with peers by publishing writing which links and cites sources.
Module 3: Mechanical Waves Lesson 3.11: Ultrasound and Infrasound (cont.)		
Module 3: Mechanical Waves Lesson 3.12: Doppler Effect	8.1.12,	Define and describe acoustics and their relationship to the Doppler Effect. Draws connections between the topic of the discussion and larger themes Examine views of others and revise own views if warranted. Explain the Doppler Effect and list real-world examples where the Doppler Effect is used (i.e. police radar and Doppler radar). Explain the impact of distance has on the Doppler Effect. Use technology to collaborate with peers by publishing writing which links and cites sources.
Module 3: Mechanical Waves Lesson 3.13: Supersonic and Sonic Booms	8.1.12,	Define and explain sonic and supersonic booms. Draws connections between the topic of the discussion and larger themes Examine views of others and revise own views if warranted. Explain what is the sound barrier. Use technology to collaborate with peers by publishing writing which links and cites sources.
Module 3: Mechanical Waves Lesson 3.14: Module Review		
Module 3: Mechanical Waves Lesson 3.14: Module Review (cont.)		
Module 3: Mechanical Waves Lesson 3.15: Module Exam		
Module 3: Mechanical Waves Lesson 3.15: Module Exam (cont.)		
Module 4: Light Lesson 4.01: Light	8.1.12,	Define the important terms pertaining to light waves including transmission, reflection, refraction, and absorption. Describe white light as a mixture of different wavelengths (colors). 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.

Module 4: Light Lesson 4.02: Electromagnetic Waves and Fields	8.1.12,	Compare electromagnetic waves with mechanical waves. Describe the primary characteristics of the electromagnetic spectrum. Explain that human eyes respond to a narrow range of wavelengths within the electromagnetic spectrum (red through violet) called visible light. Recognize that the sun's radiation consists of a wide range of wavelengths, mainly visible light and infrared and ultraviolet radiation.
Module 4: Light Lesson 4.02: Electromagnetic Waves and Fields (cont.)		
Module 4: Light Lesson 4.03: Interference of Light	8.1.12,	Describe interference of light as the way in which two set of waves (such as light) can combine with each other to produce a resultant wave. Explain constructive and destructive interference of light. Explain interference of monochromatic light produced by reflection.
Module 4: Light Lesson 4.04: Electromagnetic Spectrum	8.1.12,	Describe the primary characteristics of the electromagnetic spectrum. Explain that human eyes respond to a narrow range of wavelengths within the electromagnetic spectrum (red through violet) called visible light. Relate various forms of electromagnetic radiation to wavelength, frequency, and energy.
Module 4: Light Lesson 4.05: Radio and Microwaves	8.1.12,	Describe examples of the use of electromagnetic radiation in everyday life in the form of radio waves and microwaves. Distinguish between the different parts of the electromagnetic spectrum, namely radio waves and microwaves.
Module 4: Light Lesson 4.06: Infrared	8.1.12,	Describe infrared, visible light, and ultraviolet relative to each other in terms of their wavelengths and energy. Explain how detecting gamma- and X-rays can allow astronomers to observe the most powerful phenomena in the Universe, such as black holes devouring matter and supernova explosions. Explain how gamma, x rays, and UV are absorbed by the atmosphere.
Module 4: Light Lesson 4.07: X-rays and UV and Gamma Rays	8.1.12,	Describe infrared, visible light, and ultraviolet relative to each other in terms of their wavelengths and energy. Explain how detecting gamma- and X-rays can allow astronomers to observe the most powerful phenomena in the Universe, such as black holes devouring matter and supernova explosions. Explain how gamma, x rays, and UV are absorbed by the atmosphere.
Module 4: Light Lesson 4.08: Index of Refraction	8.1.12,	Define the important terms pertaining to light waves including transmission, reflection, refraction, and absorption. Describe white light as a mixture of different wavelengths (colors). 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.

Module 4: Light Lesson 4.09: How Light Moves	8.1.12, 8.2.2	Explain and give examples of how light can be reflected, refracted, transmitted, and absorbed by matter. Interpret a diagram showing how the angle of reflection is equal to the angle of incidence of a beam of light.
Module 4: Light Lesson 4.10: Convex and Concave Mirrors	8.1.12,	Compare and contrast the primary characteristics of convex and concave mirrors and their effects on images. Explain how a mirror affects the path of light.
Module 4: Light Lesson 4.11: Lenses	8.1.12,	Describe the difference between convex and concave lenses and their different effects on images. Explain various uses of lenses (e.g., in the human eye, a magnifying glass, camera, telescope, and microscope).
Module 4: Light Lesson 4.12: Your Eye	8.1.12,	Describe the difference between convex and concave lenses and their different effects on images. Describe the main parts of the human eye. Explain that human eyes respond to a narrow range of wavelengths within the electromagnetic spectrum (red through violet) called visible light. Explain various uses of lenses (e.g., in the human eye, a magnifying glass, camera, telescope, and microscope).
Module 4: Light Lesson 4.13: Module Review		
Module 4: Light Lesson 4.13: Module Review (cont.)		
Module 4: Light Lesson 4.14: Module Exam		
Module 4: Light Lesson 4.14: Module Exam (cont.)		
Module 5: Electricity and Magnetism Lesson 5.01: Electricity and Magnetism	8.1.12,	Compare and contrast open and closed series circuits and parallel circuits. Explain how electrical resistance affects current. Explain how electromagnets work. Explain that objects become electrically charged when they gain or lose electrons. Explain the source of magnetic fields. Identify materials that are magnetic. Recognize that a changing magnetic field can induce a current in a conductor.
Module 5: Electricity and Magnetism Lesson 5.02: Electric Charge	8.1.12,	Describe an electric field. Describe how charged objects experience forces of attraction or repulsion. Describe the area where one or more charged particles exert a force on another charge as an electric field. Explain that objects become electrically charged when they gain or lose electrons.
Module 5: Electricity and Magnetism Lesson 5.03: Electric Currents	8.1.12,	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.
Module 5: Electricity and Magnetism Lesson 5.04 Electric Circuits	8.1.12,	Analyze and label the parts of an electric circuit. Describe an electric circuit as a complete closed path for an electric current. Compare and contrast series and parallel circuits. Describe how to draw electrical circuits and circuit diagrams. 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. Interpret and compare diagrams of open and closed electric circuits, including series and parallel circuits.
Module 5: Electricity and Magnetism Lesson 5.05: Magnetism	8.1.12,	Compare a magnetic field with an electrical field. Define magnetic poles and explain what it means for a magnet to be dipolar. Describe how magnets are made, and how Earth is a really large magnet. Explain a diagram that shows the lines of force in a magnetic field. Identify materials that are magnetic.
Module 5: Electricity and Magnetism Lesson 5.06: Electricity and Magnets	8.1.12,	Describe how different variables influence the strength of an electromagnet. Describe the parts and process of making an electromagnet. Explain how a magnetic field can be created by an electric current flowing in a wire. Explain what an electromagnet is and how it is considered to be a temporary magnet.
Module 5: Electricity and Magnetism Lesson 5.07: Motors and Generators	8.1.12,	Compare and contrast an electric motor and an electric generator. Describe how an electric current is created when a circuit is exposed to a changing magnetic field. Examine views of others and revise own views if warranted. Explain how generators convert mechanical energy into electrical energy.
Module 5: Electricity and Magnetism Lesson 5.08: The World's Energy	8.1.12,	Compare and contrast an electric motor and an electric generator. Describe how an electric current is created when a circuit is exposed to a changing magnetic field. Examine views of others and revise own views if warranted. Explain how generators convert mechanical energy into electrical energy.
Module 5: Electricity and Magnetism Lesson 5.08: The World's Energy (cont.)		
Module 5: Electricity and Magnetism Lesson 5.09: Module Review		
Module 5: Electricity and Magnetism Lesson 5.09: Module Review (cont.)		
Module 5: Electricity and Magnetism Lesson 5.10: Module Exam		

Module 5: Electricity and Magnetism Lesson 5.10: Module Exam (cont.)		
Module 5: Electricity and Magnetism Lesson 5.11: Portfolio		
Module 5: Electricity and Magnetism Lesson 5.11: Portfolio		
Module 5: Electricity and Magnetism Lesson 5.11: Portfolio		