Wyoming Department of Education Required Virtual Education Course Syllabus

Natrona County School District # 1

Program Name	Natrona Virtual Learning	Conten Area	SC
Course ID	NVA0780012	Grade Level	8
Course Name	SCI08 MS Physical Science	o Credits	
SCE Code	78002	Curriculum Type	K1 Inc

COURSE DESCRIPTION

The K12 Physical Science Sem. 1 program introduces students to many aspects of the physical world, focusing first on chemistry and then on physics. The Sem. 1 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
8.1.10	The Structure and Properties of Matter: Students identify characteristic properties of matter such as density, solubility, and boiling point and understand that elements are the basic components of matter.
8.1.11	Physical and Chemical Changes in Matter: Students evaluate chemical and physical changes, recognizing that chemical change forms compounds with different properties and that physical change alters the appearance but not the composition of a substance.
8.1.14	Effects of Motions and Forces: Students describe motion of an object by position, direction, and speed, and identify the effects of force and inertia on an object.
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.
8.2.3	Students clearly and accurately communicate the result of their own work, as well as information obtained from other sources.
8.2.4	Students recognize the relationship between science and technology in meeting human needs.
8.2.5	Students properly use appropriate scientific and safety equipment, recognize hazards and safety symbols, and observe standard safety procedures.

SCOPE AND SEQUENCE		
UNIT OUTLINE	STANDARD#	OUTCOMES OBJECTIVES/STUDENT CENTERED GOALS
Module 1: Intro to Physical Science Lesson 1.01: Intro to Physical Science	8.1.10	Describe and explain a model system physicists have used to represent a real phenomenon. Describe physical science as the study of matter and energy. Differentiate different samples using factors such as density, size, and temperature. Make measurements using the SI system.
Module 1: Intro to Physical Science Lesson 1.02: Physical Systems	8.1.10	Define universal law and give an example. Describe how scientists use models to represent and predict real phenomena in the physical world. Distinguish between a closed system and an open system. Recognize that models change to accommodate new discoveries and observations.
Module 1: Intro to Physical Science Lesson 1.03: Measurement and the SI	8.1.10	Explain why scientists need a system of measurements. Identify fundamental units of the SI and associate each unit with what it measures. Identify the appropriate abbreviation funits of measurement, including SI units. Measure physical quantities using the International System of Units (SI).
Module 1: Intro to Physical Science Lesson 1.04: Making a Kilodollar	8.1.10	Compare the scale of the quantities represented by the different prefixes fthe SI units of measurement. Explain why scientists need a system of measurements. Identify fundamental units of the SI and associate each unit with what it measures. Identify the prefixes used in the metric system and the quantities they represent. Measure physical quantities using the International System of Units (SI).
Your Choice (Can use optional lab discussions)		
Module 1: Intro to Physical Science Lesson 1.05: Model Problems		Gain experience answering model problems related to topics of the previous lessons. Recognize the purpose and use of model problems in this course of study.
Module 1: Intro to Physical Science Lesson 1.06: Scientific Methods	8.2.1, 8.2.2, 8.2.3, 8.2.4, 8.2.5	Describe a scientific investigation as observational experimental. Distinguish a scientific investigation from a demonstration. Pose a specific question that can be investigated with

		scientific experimentation. Use the processes of scientific investigation to design and conduct experiments.
Module 1: Intro to Physical Science Lesson 1.07: Experimental Design	8.2.1, 8.2.2, 8.2.3, 8.2.4, 8.2.5	Describe the problems associated with not following a written procedure exactly as it was written, as well as the problems with poorly written procedures. Design an investigation to test a hypothesis and gather information. Explain the importance of writing a chronological, step-by-step set of instructions (procedure) that can be identically replicated by another experimenter. Explain what details can be added to a procedure to make it more easy to follow. Formulate a hypothesis based on available information. Identify independent and dependent variables, constraints, and controls in your investigation. State the purpose of the experiment. Write a step-by-step procedure fthe scientific investigation.
Module 1: Intro to Physical Science Lesson 1.08: Scientific Sources	8.2.1, 8.2.2, 8.2.3, 8.2.4, 8.2.5	Design an investigation to test a hypothesis and gather information. Use the processes of scientific investigation to design and conduct experiments.
Module 1: Intro to Physical Science Lesson 1.08: Scientific Sources (cont.)		
Module 1: Intro to Physical Science Lesson 1.09: Data Collection	8.2.2	Collect data during a scientific investigation. Describe the differences between quantitative and qualitative data. Design a data collection table to collect estimates, measurements, and results. Determine the mean and mode fa data set. Measure, record, calculate, and report results, using metric units.
Module 1: Intro to Physical Science Lesson 1.10: Data Analysis	8.2.2	Compare and contrast the main features and uses of bar graphs, line graphs, and circle graphs. Describe the differences between quantitative and qualitative data. Determine appropriate ways to report data from an investigation. Use graphs and charts to share experimental data.
Your Choice (Can use optional lab discussions)		
Module 1: Intro to Physical Science Lesson 1.11: Reporting Conclusions	8.2.3	Draw conclusions based on the results of an investigation. Identify possible sources of errin the experiment and in the data collected. Identify sources of

		information used in scientific research. Summarize an investigation in a written report.
Module 1: Intro to Physical Science Lesson 1.12: Create a Display	8.2.3	Display scientific data using tables, charts, graphs, visuals, written descriptions. Explain why it is important to present a research experiment and the findings on a display.
Module 1: Intro to Physical Science Lesson 1.13: Oral Presentation	8.2.3	Communicate orally the background, methods, results, interpretation, and conclusions of an investigation. Develop a plan fan oral presentation. Explain why it is important to present a research experiment and the findings through an oral presentation.
Module 1: Intro to Physical Science Lesson 1.14: Module Review		
Module 1: Intro to Physical Science Lesson 1.14: Module Review (cont.)		
Module 1: Intro to Physical Science Lesson 1.15: Module Exam	8.2.1, 8.2.2, 8.2.3, 8.2.4, 8.2.5	
Module 1: Intro to Physical Science Lesson 1.15: Module Exam (cont.)		
Module 2: Matter Lesson 2.01: Matter	8.1.10	Describe how scientific discoveries explain the nature of the materials that make up our world. Describe six properties of matter. Describe the patterns of organization represented in the periodic table. Describe the structure of an atom of an element and its isotopes. Distinguish between physical changes and chemical changes. Explain how and why materials that make up our world change. Explain how the motion of molecules differs in different states of matter.
Module 2: Matter Lesson 2.02: Atoms	8.1.10	Describe how and why models of the atom have changed over time. Describe one model structure of an atom as a nucleus made up of protons and neutrons, surrounded by electrons. Describe the significant historical models and scientists that contributed to modern model of an atom. Describe the specific particles of an atom – proton, neutron, electron – and their relationship with one another. Explain that all matter is made up of atoms. Explain what is an

		element and what makes one element different from another.
Module 2: Matter Lesson 2.03: A Model of an Atom	8.1.10	Build an accurate model of an atom. Describe how and why models of the atom have changed over time. Describe one model structure of an atom as a nucleus made up of protons and neutrons, surrounded by electrons. Describe the specific particles of an atom – proton, neutron, electron – and their relationship with one another. Explain that all matter is made up of atoms.
Module 2: Matter Lesson 2.03: A Model of an Atom (cont.)		
Module 2: Matter Lesson 2.04: Atomic and Mass Numbers	8.1.10	Compare atomic number with the atomic mass of an element. Define atomic number. Define isotope and explain the difference between stable and radioactive isotopes. Explain how an isotope of an element has the same number of protons but a different number of neutrons in the nucleus. Explain how the atomic number is related to an element's number of protons, neutrons, and electrons. Explain what is an element's atomic mass and how it is calculated. Recognize that isotopes of an element typically have many similar characteristics.
Module 2: Matter Lesson 2.05: Labeling an Atom	8.1.10	Compare atomic number with the atomic mass of an element. Define atomic number. Explain how an isotope of an element has the same number of protons but a different number of neutrons in the nucleus. Explain how the atomic number is related to an element's number of protons, neutrons, and electrons. Explain what is an element's atomic mass and how it is calculated. Recognize that isotopes of an element typically have many similar characteristics.
Module 2: Matter Lesson 2.06: Periodic Table and Elements	8.1.10	Define and explain period, group, and family as it relates to sections of elements seen together on the Periodic Table. Describe the historical development of the periodic table, including Mendeleev's contributions, based on physical characteristics. Explain how the arrangement of

		elements in the periodic table now reflects the number of protons and electrons in atoms. Identify elements as the basic building blocks of matter.
Module 2: Matter Lesson 2.07: Design of the Periodic Table	8.1.10	Describe the design of the periodic table and explain how elements are grouped (e.g., families and periods). Explain how shared exchanged electrons changes the charge of an element's atom. Identify areas of the periodic table that group metals, nonmetals, and inert gases. Interpret a diagram that displays information about a specific element (e.g., symbol, atomic number, name of element, and atomic mass.
Module 2: Matter Lesson 2.08: Boiling and Melting Points	8.1.10	Compare boiling points and melting points of different elements and identify trends in the periodic table. Describe the design of the periodic table and explain how elements are grouped (e.g., families and periods). Identify areas of the periodic table that group metals, nonmetals, and inert gases. Interpret a diagram that displays information about a specific element (e.g., symbol, atomic number, name of element, and atomic mass.
Module 2: Matter Lesson 2.08: Boiling and Melting Points (cont.)		
Module 2: Matter Lesson 2.09: Molecules	8.1.10	Define a molecule as two 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. Explain that a molecule is the smallest particle of a compound with all the properties of that substance. Explain the role of shared and borrowed electrons in forming molecules.
Module 2: Matter Lesson 2.10: Molecules fGood Health	8.1.10	Define a molecule as two 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. Describe the role of elements and molecules in making up the nutrients we eat and drink. Explain that a molecule is the smallest particle of a compound with all the properties of that substance.

Module 2: Matter Lesson 2.11: Properties of Matter	8.1.10	Differentiate physical and chemical properties of matter. Give examples of chemical properties of substances. Give examples of physical properties of substances.
Module 2: Matter Lesson 2.12: States of Matter	8.1.10	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. Identify different states of matter.
Your Choice (Can use optional lab discussions)		
Module 2: Matter Lesson 2.13: Physical and Chemical Changes	8.1.10	Distinguish examples of physical and chemical changes. Give examples of chemical properties of substances. Recognize that chemical reactions release absorb heat.
Module 2: MatterLesson 2.14: Module Review	8.1.10	
Module 2: Matter Lesson 2.14: Module Review (cont.)		
Module 2: Matter Lesson 2.15: Module Exam	8.1.10	
Module 2: Matter Lesson 2.15: Module Exam (cont.)		
Module 3: Chemistry Lesson 3.01: Chemistry	8.1.11	Balance chemical equations and explain what it means to balance such an equation. Compare the chemistry of acids and bases. Compare the chemistry of ionic and covalent bonds. Describe how the arrangement of electrons affects the formation of ionic and covalent compounds. Explain how chemical reactions occur. Explain how compounds are formed by combining two more different elements. Explain how the properties of any substance depends on the arrangement and types of atoms that are bonded together. Explain what is modeled by a chemical formula. Interpret graphs showing the rates of chemical reactions. Recognize that the properties of compounds differ from their constituent elements and provide examples.
Module 3: Chemistry Lesson 3.02: Chemical Reactions	8.1.11	Describe how chemical reactions involve breaking and reforming bonds (either ionic covalent). Describe the relationship between reactants and

		products in a chemical reaction. Explain how reactants enter into chemical reactions that result in products. Explain that energy is always involved in chemical reactions either as absorption release of heat. Recognize that chemical reactions may involve the formation of a precipitate, the generation of gas, a change in color.
Module 3: Chemistry Lesson 3.03: Chemical Formulas	8.1.11	Compare ionic and covalent bonds. Compare ionic and covalent compounds and their molecular formulas. Describe how to write ionic and covalent compound formulas. Explain and give examples of how chemical formulas can express chemical reactions. Identify various compounds by their chemical formulas.
Module 3: Chemistry Lesson 3.04: Rates of Chemical Reactions	8.1.11	Describe factors that influence the rate of reactions (e.g., changing the concentration of reactants, changing the surface area of solids, using a catalyst). Explain that chemical reactions occur at different rates. Explain that reactions occur at different rates and that reaction rates can change. Explain what it means fa reaction to have reached equilibrium. Provide examples that illustrate different reaction rates.
Module 3: Chemistry Lesson 3.05: Chemical Equations	8.1.11	Describe a chemical reaction using a chemical equation. Explain "conservation of mass" in chemical reactions. Explain how to balance chemical equations, showing that nothing is gained lost in a chemical reaction.
Module 3: Chemistry Lesson 3.06: A Balancing Act	8.1.11	Describe a chemical reaction using a chemical equation. Explain "conservation of mass" in chemical reactions. Explain how to balance chemical equations, showing that nothing is gained lost in a chemical reaction. Develop models to describe the atomic composition of simple molecules and extended structures. 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.
Module 3: Chemistry Lesson 3.07: Solutions	8.1.11	Define and differentiate solvent, solute, and solution. Describe what it means fa solution to be saturated.

		Explain the different types of pure substances. Interpret data presented in solubility graphs and explain the effect of different variables on solubility rates.
Your Choice (Can use optional lab discussions)		
Module 3: Chemistry Lesson 3.08: Substances	8.1.11	Compare mixtures and solutions. Explain the difference between a pure substance and a mixture. Given a list of common substances and/chemical formulas, classify matter as elements, molecules, compounds, solutions, mixtures.
Module 3: Chemistry Lesson 3.09: Acids and Bases	8.1.11	Compare properties of acids and bases. Define pH and explain how it is determined. Describe how litmus paper is used as an indicatof something being acidic basic. Determine whether a given solution is acidic, basic, neutral. Explain how a pH scale is used to determine the acidity basic properties of a solution. Recognize and label common acids and bases.
Module 3: Chemistry Lesson 3.10: Module Review	8.1.11	
Module 3: Chemistry Lesson 3.10: Module Review (cont.)		
Module 3: Chemistry Lesson 3.11: Module Exam	8.1.11	
Module 3: Chemistry Lesson 3.11: Module Exam (cont.)		
Module 4: Motion and Newton’s Laws Lesson 4.01: Motion and Newton's Laws	8.1.14	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. Draw conclusions based on data gathered in an experiment. Explain how Newton's three laws are all related.
Module 4: Motion and Newton’s Laws Lesson 4.02: Motion	8.1.14	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. Explain that motion is established with respect to a frame of reference. Interpret diagrams that represent motion.

Module 4: Motion and Newton's Laws Lesson 4.03: Calculating Speed	8.1.14	Calculate a quantity that is derived from other, more basic, quantities that are measured. Design an experiment to test a hypothesis to gather information; state the purpose of the experiment. Draw conclusions based on data gathered in an experiment.
Module 4: Motion and Newton's Laws Lesson 4.03: Calculating Speed (cont.)		
Module 4: Motion and Newton's Laws Lesson 4.04: Speed and Velocity	8.1.14	Compare and contrast speed and velocity and how they both change. Define speed as the distance an object has traveled divided by time. Define velocity as the speed of an object in a certain direction. Interpret information about speed and velocity presented in tables and graphs. Solve problems about speed.
Module 4: Motion and Newton's Laws Lesson 4.05: Measuring Speed and Velocity	8.1.14	Compare and contrast speed and velocity and how they are measured. Describe the variables in the formulas fspeed and velocity. Explain that velocity in one dimension may be positive negative while speed always has a positive value. Solve problems about speed and velocity using graphs, drawings, and computation.
Module 4: Motion and Newton's Laws Lesson 4.06: Changing Velocity Math	8.1.14	Solve problems about speed and velocity using graphs, drawings, and computation.
Module 4: Motion and Newton's Laws Lesson 4.07: Newton's Second Law of Motion	8.1.14	Define acceleration as a change in velocity per unit of time. Explain Newton's Second Law of Motion. Explain that the acceleration of an object depends on its mass and the total amount of force applied to it. Solve problems using the formula F = ma.
Your Choice (Can use optional lab discussions)		
Module 4: Motion and Newton's Laws Lesson 4.08: Acceleration	8.1.14	Define acceleration as the rate of change of velocity. Describe how acceleration and gravity are related. Explain that changes in velocity may be caused by changes in speed and direction. Explain the variables in the formula facceleration; and apply the formula to calculate facceleration to calculate fone variable if the acceleration and the other variable are given. Fmotion in one dimension, distinguish among positive, negative, and no acceleration.

Module 4: Motion and Newton's Laws Lesson 4.09: Balanced and Unbalanced Forces	8.1.14	Describe how to diagram forces with arrows that show the relative size and direction of each force. Distinguish between balanced and unbalanced forces. Explain how equal & opposite forces cause an object to remain at rest move at a constant velocity. Explain how unbalanced forces change the motion of an object.
Module 4: Motion and Newton's Laws Lesson 4:10: Newton's Math	8.1.14	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.
Module 4: Motion and Newton's Laws Lesson 4.11: Module Review		
Module 4: Motion and Newton's Laws Lesson 4.11: Module Review (cont.)		
Module 4: Motion and Newton's Laws Lesson 4.12: Module Exam		
Module 4: Motion and Newton's Laws Lesson 4.12: Module Exam (cont.)		
Module 5: Force and Momentum Lesson 5.01: Force and Momentum	8.1.14	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.
Module 5: Force and Momentum Lesson 5.02: Force	8.1.14	Define force as a push a pull that can cause an object to move, stop moving, change speed, change direction. Explain that a force has direction and strength (magnitude). Explain the effects of force as it relates to moving objects such as a car and its passengers. Identify a variety of forces such as gravity, magnetism, friction, spring, and electrical. Interpret a diagram to describe the forces acting on a specific object and their cumulative effect. Recognize that an object at rest, upon which balanced forces are acting, will not change its state of motion.
Module 5: Force and Momentum Lesson 5.03: Gravitational Force	8.1.14	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. Describe fundamental notions of how scientists think gravity shaped planets, stars, and solar systems. 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.
Module 5: Force and Momentum Lesson 5.04: Friction	8.1.14	Describe friction as a force that opposes motion, makes it difficult fan object to move across a surface. Describe how everyday life provides examples of how friction both helps and hinders everything we do. Explain how the amount of friction depends on the surface type and the force pressing two surfaces together.
Module 5: Force and Momentum Lesson 5.05: Free Body Diagrams	8.1.14	Apply free-body diagrams to various objects that have forces being applied to them. Explain the relationship between mass and acceleration in Newton's 2nd Law. Use Newton's laws & free-body diagrams to predict the acceleration of a system.
Module 5: Force and Momentum Lesson 5.06: Buoyant Forces	8.1.14	Apply the principle of buoyant force to predict whether objects will float sink in a fluid. Explain that an object floats when its density is less than the density of the fluid surrounding it. Explain that the buoyant force on an object is equal to the weight of the fluid that the object displaces.
Module 5: Force and Momentum Lesson 5.07: Spring Force	8.1.14	Apply spring force and elastic properties data to find that strain is proportional to stress. Define Hooke's Law. Describe the properties of elastic bodies. Distinguish between extension (strain) and force of weight Explain how changes in force may affect the amount of extension (stretch) in an elastic body.
Module 5: Force and Momentum Lesson 5.08: Momentum	8.1.14	Compare and contrast the kinetic energy and momentum of a moving object. Define impulse and solve a problem about impulse. Describe how an object's momentum increases as its mass and velocity increase. Determine the momentum of an object. Explain how an object's momentum describes how difficult it is to stop the object in motion. Explain the difference between scalar quantity and vectquantity.

Your Choice (Can use optional lab discussions)		
Module 5: Force and Momentum Lesson 5.09: Momentum and Newton's Laws	8.1.14	Compare and contrast the kinetic energy and momentum of a moving object. Describe how an object's momentum increases as its mass and velocity increase. Define impulse and solve a problem about impulse. Determine the momentum of an object. Explain how an object's momentum describes how difficult it is to stop the object in motion.
Module 5: Force and Momentum Lesson 5.10: Momentum and Collisions	8.1.14	Apply the law of the conservation of momentum to solve problems involving collisions. Describe and apply the formula fmomentum through mathematical word problems. (TGA/ME) Define impulse and solve a problem about impulse. Determine the momentum of an object. Predict the outcomes of speed and collision competitions between vehicles based on the speed and momentum data.
Module 5: Force and Momentum Lesson 5.11: Momentum and Collision Math	8.1.14	Apply the law of the conservation of momentum to solve problems involving collisions. Define impulse and solve a problem about impulse. Describe and apply the formula fmomentum through mathematical word problems. (TGA/ME) Determine the momentum of an object. Predict the outcomes of speed and collision competitions between vehicles based on the speed and momentum data.
Module 5: Force and Momentum Lesson 5.11: Momentum and Collision Math (cont.)		
Module 5: Force and Momentum Lesson 5.12: Module Review	8.1.14	
Module 5: Force and Momentum Lesson 5.12: Module Review (cont.)		
Module 5: Force and Momentum Lesson 5.13: Module Exam	8.1.14	
Module 5: Force and Momentum Lesson 5.13: Module Exam (cont.)		
Module 5: Force and Momentum Lesson 5.14: Portfolio		

Module 5: Force and MomentumLesson 5.14: Portfolio (cont.)		
Module 5: Force and Momentum Lesson 5.14: Portfolio (cont.)		