Ganado Unified School District
(Phy. Scie./Grade 11th and 12th)

PACING Guide SY 2021 - 2022

ROSA D. BERCASIO

Timeline	AZ Science Standards	Crosscutting Concepts and Background Information	Learning Goals and Topics
Quarter 1	**Strand 1: Inquiry** **Concept 1: Observations, Questions, and Hypotheses** **Concept 2: Scientific Testing (Investigating and Modeling)** **Concept 3: Analysis and Conclusions** **Concept 4: Communication**	**Crosscutting Concepts:** Patterns; Cause and Effect; Scale, Proportion and Quantity and System Models and Scientific inquiry in the concept of Science. **Background Information**: The scientific method is a process for experimentation that is used to explore observations and answer questions. The process in the **scientific method** involves making conjectures (hypotheses), deriving predictions from them as logical consequences, and then carrying out experiments or empirical observations based on those predictions. A hypothesis is a conjecture, based on knowledge obtained while seeking answers to the question.	**Student will demonstrate an understanding o** **Scientific reasoning, logic, and the nature of Science by planning and conducting investigations** **in which:** □ chemicals and equipment are used safely; □ length, mass, volume, density, temperature, weight, and force are accurately measured; □ conversions are made among metric units, applying appropriate prefixes; □ triple beam and electronic balances, thermometers, metric rulers, graduated cylinders, probeware, and spring scales are used to gather data; □ numbers are expressed in scientific notation where appropriate; □ independent and dependent variables, constan controls, and repeated trials are identified

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	P3: Changing the movement of an object requires a net force to be acting on it. **P3: HS+ Phy. P3U1.6** Collect, analyze and interpret data regarding the change in motion of an object or system in one dimension to construct and explain using Newton's Laws. **P3: HS+Phy.P3U1.2** Develop and use mathematical models of Newton's law of gravitation and Coulomb's law to describe and predict the gravitational and electrostatic forces between objects. **P1: HS+ C .P1U1.2 -** Obtain, evaluate, and communicate the qualitative evidence supporting claims about how atoms absorb and emit energy in the form of electromagnetic radiation. **P4: HS.P4U1.8** Engage in argument from evidence that	**Crosscutting Concepts:** Patterns; Cause and Effect; Scale, Proportion and Quantity and System Models; Motion and Force; Structure and Function of Newton's Law of Motion and Heat Energy. **Background Information:** Newton's second law accurately predicts changes in the motion of macroscopic objects, but it requires revision for subatomic scales or for speeds close to the speed of light. Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. In any system, total momentum is always conserved. If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system.4 (p. 116) The application of science in making new materials is an example of how scientific knowledge has led advances in technology and provided engineers with a wider choice in	**Students will investigate and understand the scientific principles of work, force, and motion.** speed, velocity, and acceleration; Newton's laws of motion; • work, force, mechanical advantage, efficiency, and power; and technological applications of work, force, and motion. - . Potential; - Kinetic; - Mechanical; - Chemical; - Electrical; - Thermal; - Radiant and,

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	the net change of energy in a system is always equal to the total energy exchanged between the system and the surroundings.	designing constructions. At the same time technological advances have helped scientific developments by improving instruments for observation and measuring, automating processes that might otherwise be too dangerous or time consuming to undertake, and particularly through the provision of computers. Thus, technology aids scientific advance.	- Nuclear energy
Quarter 2	**P4: HS.P4U1.8 –** Engage in argument from evidence that the net change of energy in a system is always equal to the total energy exchanged between the system and the surroundings. **P1: HS+C.P1U1.2** – Obtain, evaluate, and communicate the qualitative evidence supporting claims about how atoms absorb and emit energy in the form of electromagnetic radiation.	**Crosscutting Concepts:** Patterns; Cause and Effect; Scale, Proportion and Quantity; System and System Models; Energy and Matter; Structure and Function; Stability and Change **Background Information:** Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, that are matched by changes in kinetic energy. In	**Student will investigate and understand the characteristics of sound waves. Key concepts include:** wavelength, frequency, speed, amplitude, rarefaction, and compression; resonance; the nature of compression waves; and technological applications of sound wavelength, frequency, speed, amplitude, crest, and trough; the wave behavior of light; images formed by lenses and mirrors;

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	P4: HS+Phy.P4U2.7 – Design, evaluate, and refine a device that works within given constraints to transfer energy within a system.	many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.	the electromagnetic spectrum; and technological applications of light **Student will investigate and understand basic principles of electricity and magnetism.** Key concepts include: static electricity, current electricity, and circuits; relationship between a magnetic field and an electric current; electromagnets, motors, and generators and their uses; and conductors, semiconductors, and insulators
Quarter 3	P1: HS. P1U1.1 – Develop and use models to explain the relationship of the structure of atoms to patterns and properties observed within the Periodic Table and describe how these models are	**Crosscutting Concepts:** Patterns; Cause and Effect; Scale, Proportion and Quantity; System and System Models; Energy and Matter; Structure and Function; Stability and Change **Background Information:**	The student will investigate and understand the nature of matter. Key concepts include: the particle theory of matter; physical changes; chemical changes; and nuclear reactions

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	revised with new evidence. **P1 :HS .P1U1.1 –** Develop and use models to explain the relationship of the structure of atoms to patterns and properties observed within the Periodic Table and describe how these models are revised with new evidence. **P1:HS +C.P1U1.1** – Develop and use models to demonstrate how changes in the number of subatomic particles (protons, neutrons, electrons) affect	**Chemical processes**, their **rates**, and whether or not **energy** is **stored** or **released** can be understood in terms of the **collisions** of **molecules** and the rearrangements of **atoms** into new molecules, that are matched by changes in **kinetic energy**. In many situations, a dynamic and condition-dependent balance between a **reaction** and the reverse reaction determines the numbers of all types of molecules present. The fact that atoms are **conserved**, together with knowledge of the **chemical properties** of the elements involved, can be used to describe and predict chemical reactions.	□ elements, compounds, mixtures, acids, bases, and salts; □ solids, liquids, and gases; □ physical properties; □ chemical properties; and □ characteristics of types of matter based on physical and chemical properties. the historical development of atomic theory. □ the contributions of Dalton, Thomson, Rutherford, and Bohr in understanding the atom; □ the modern model of atomic structure; and □ comparing the Modern Atomic model to past ideas and models. Structure of Atom

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	the identity, stability, and properties of the element. P1 :HS +C. P1U1.2 – Obtain, evaluate, and communicate the qualitative evidence supporting claims about how atoms absorb and emit **P1:8. P1U1.2 –** Obtain and evaluate information regarding how scientists identify substances based on unique physical and chemical properties.		Properties of Elements and Matter Periodic Table Classifying Matter including compounds, mixtures, and solutions.
Quarter 4	**P1: HS+C.P1U1.2 –** Obtain, evaluate, and communicate the qualitative evidence supporting claims about how atoms absorb and emit energy in the form of	**Crosscutting Concepts:** Patterns; Cause and Effect; Scale, Proportion and Quantity; System and System Models; Energy	Student will investigate and understand basic principles of electricity and magnetism.

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	electromagnetic radiation. **P4: HS + Phy.P4U2.7 –** Design, evaluate, and refine a device that works within given constraints to transfer energy within a system.	and Matter; Structure and Function; Stability and Change **Background Information:** Scientific understanding can help to identify implications of certain applications but decisions about whether certain actions should be taken will require **ethical and moral judgements** which are not provided by knowledge of science. There is an important difference between the understanding that science provides about, for example, the need to preserve biodiversity, the factors leading to climate change and the adverse effects of harmful substances and lifestyles, and the actions that may or may not be taken in relation to these issues. Opinions may vary about what action to take but arguments based on scientific evidence should not be a matter of opinion. The total number of neutrons plus protons does not change in any **nuclear process**. Strong and weak nuclear interactions determine	Key concepts include: □ static electricity, current electricity, and circuits; □ relationship between a magnetic field and an electric current; □ electromagnets, motors, and generators and their uses; and □ conductors, semiconductors, and insulators.

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		nuclear stability and processes. Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials from the isotope ratios present.	

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