NORTH CAROLINA STANDARD COURSE OF STUDY

K-12 Science, Physical Science

The North Carolina 2023 K-12 Science Standards are intended to foster conceptual understanding and help develop scientifically literate students. The standards provide foundational knowledge and practices within each grade band and course. The standards are organized within 11 strands which articulate vertical alignment. As students progress from one grade to the next, the depth of knowledge and level of sophistication increases.

Engaging in science encourages students' curiosity, interests, and prepares them for the broadest range of postsecondary opportunities, be it college, career, or military service. The 2023 K-12 Science Standards are designed to allow students to become active participants in science - building their understanding of the natural world through observations and investigations.

The scientific method provides a common framework for introducing the traditional experimental design and hypothesis-testing process. The methodologies or approaches utilized by scientists can vary depending on the nature of their research questions and available tools. Steps that all scientists follow when conducting scientific investigations usually involve asking questions, the collection and analysis of relevant data, the use of logical reasoning, opportunities to communicate and collaborate with others, and the development of explanations.

The Science and Engineering Practices (SEP) are embedded in the standards to support a greater emphasis on how students develop science knowledge and the durable skills within the NC Portrait of a Graduate. While one practice is identified in each objective, teachers should utilize other practices to support students' progress towards mastering the standards.

The North Carolina Science Standards maintain the respect for local control of each Public School Unit (PSU). These standards and objectives are not intended to be the curriculum, nor do they indicate the whole of a curriculum which will be written by a PSU or school. The K-12 Science Standard Course of Study has been developed to serve as the framework for a well-planned science curriculum which provides opportunities for investigations, experimentation, and technological design.

Physical Science	
Strand: Matter and its Interactions	
Standard	**Objectives**
PS.PSc.1 Understand types, properties, and structure of matter.	PS.PSc.1.1 Construct an explanation to classify matter as a pure substance or mixture; homogeneous or heterogeneous; element or compound; solution, colloid or suspension.
	PS.PSc.1.2 Use models to compare the phases of matter and the physical changes they undergo.
	PS.PSc.1.3 Carry out investigations to compare physical and chemical properties of matter.
	PS.PSc.1.4 Use models to interpret the data presented in Bohr diagrams and electron dot diagrams for neutral atoms of elements 1 through 18.
	PS.PSc.1.5 Use models to compare representations of atoms, ions, and isotopes.
	PS.PSc.1.6 Use the Periodic Table as a model to predict the relative properties (metallic/nonmetallic character, ionic charge, and reactivity) and arrangement of elements based on the pattern of valence electrons in the outermost energy levels of atoms.
Standard	**Objectives**
PS.PSc.2 Analyze interactions of matter within a chemical system.	PS.PSc.2.1 Construct an explanation to classify the type of chemical bond that occurs (covalent, ionic, or metallic) in a given substance.
	PS.PSc.2.2 Use models to apply International Union of Pure and Applied Chemistry (IUPAC) conventions to name and write formulas for simple compounds.
	PS.PSc.2.3 Use mathematics and computational thinking to execute the balancing of chemical equations to illustrate the Law of Conservation of Mass.
	PS.PSc.2.4 Obtain, evaluate, and communicate information to classify a chemical reaction as synthesis, decomposition, combustion, single replacement, or double replacement reaction.
	PS.PSc.2.5 Construct an explanation to compare the composition and properties of acids and bases.
	PS.PSc.2.6 Use models to explain the interactions of acids and bases in the process of neutralization.

Standard	Objectives
PS.PSc.3 Understand the role of the nucleus in radiation and radioactivity.	PS.PSc.3.1 Use models to compare nuclear reactions including alpha decay, beta decay, and gamma decay; nuclear fusion and nuclear fission.
	PS.PSc.3.2 Use mathematics and computational thinking to execute simple half-life calculations based on the radioactive decay of unstable nuclei.
	PS.PSc.3.3 Obtain, evaluate, and communicate information to explain the application of nuclear reactions to radioactive dating, medicine, and energy production.

Strand: Motion and Stability- Forces and Interactions	
Standard	**Objectives**
PS.PSc.4 Analyze motion in terms of speed, velocity, acceleration, and momentum.	PS.PSc.4.1 Analyze and interpret data to explain the motion of an object moving with a constant velocity or that is accelerating.
	PS.PSc.4.2 Analyze and interpret data to explain the relationship between impulse and an object's change in momentum.
Standard	**Objectives**
PS.PSc.5 Understand the relationship between forces and motion.	PS.PSc.5.1 Use mathematics and computational thinking to compare the weight and mass of an object.
	PS.PSc.5.2 Use models to explain the velocity of an object in freefall.
	PS.PSc.5.3Construct an explanation to infer the effects of forces (specifically applied force and friction) on objects.
	PS.PSc.5.4 Use models to explain the relationship between an object's motion and the interaction of forces acting on it according to Newton's Three Laws of Motion.
Standard	**Objectives**
PS.PSc.6 Understand electricity and magnetism and their relationship.	PS.PSc.6.1 Carry out investigations to explain static and current electricity.
	PS.PSc.6.2 Construct an explanation to compare simple series and parallel circuits in terms of Ohm's Law.
	PS.PSc.6.3 Obtain, evaluate, and communicate information to explain how current is affected by changes in composition, length, temperature, and diameter of wire.
	PS.PSc.6.4 Use models to explain magnetism in terms of domains, interactions of poles, and magnetic fields.

	PS.PSc.6.5 Obtain, evaluate, and communicate information to explain the application of electromagnets.

Strand: Energy	
Standard	**Objectives**
PS.PSc.7 Analyze energy transfers and transformations within a mechanical system.	PS.PSc.7.1 Use models to explain thermal energy and its transfer.
	PS.PSc.7.2 Use mathematics and computational thinking to explain the Law of Conservation of Energy in a mechanical system in terms of kinetic and potential energy.
	PS.PSc.7.3 Use mathematics and computational thinking to explain work in terms of the relationship among the applied force to an object, the resulting displacement of the object, and the energy transferred to an object.
	PS.PSc.7.4 Construct an explanation to infer the relationship between work and power, both quantitatively and qualitatively.

Strand: Waves and Their Applications	
Standard	**Objectives**
PS.PSc.8 Analyze the nature of waves and their applications.	PS.PSc.8.1 Carry out investigations to explain the quantitative and qualitative relationships among wave frequency, wave velocity, wavelength, and wave energy.
	PS.PSc.8.2 Use models to compare the characteristics of mechanical and electromagnetic waves.
	PS.PSc.8.3 Use models to explain the wave interactions of reflection, refraction, diffraction, and interference.
	PS.PSc.8.4 Obtain, evaluate, and communicate information to explain how instruments that transmit and detect waves are used in everyday life.