

# K-12 Onslow County Schools Physical Science Continuum

	<b>Forces and Motion</b>	<b>Matter: Properties and Change</b>	<b>Energy: Conservation and Transfer</b>	<b>Interactions of Energy and Matter</b>
<b>Kindergarten</b>	<p><b>KP1 Understand the positions and motions of objects and organisms observed in the environment.</b></p> <p>KP1.1 Compare the relative position of various objects observed in the classroom and outside using position words such as: in front of, behind, between, on top of, under, above, below and beside.</p> <p>KP1.2 Give examples of different ways objects and organisms move (to include falling to the ground when dropped): straight, zigzag, round and round, back and forth, fast and slow</p>	<p><b>KP2 Understand how objects are described based on their physical properties and how they are used.</b></p> <p>KP2.1 Classify objects by observable physical properties (including size, color, shape, texture, weight and flexibility).</p> <p>KP2.2 Compare the observable physical properties of different kinds of materials (clay, wood, cloth, paper, etc) from which objects are made and how they are used.</p>		
<b>Grade 1</b>	<p><b>1P.1 Understand how forces (pushes or pulls) affect the motion of an object.</b></p> <p>1P.1.1 Explain the importance of a push or pull to changing the motion of an object.</p> <p>1P.1.2 Explain how some forces (pushes and pulls) can be used to make things move without touching them, such as magnets.</p> <p>1P.1.3 Predict the effect of a given force on the motion of an object, including balanced forces.</p>			
<b>Grade 2</b>	<p><b>2P.1 Understand the relationship between sound and vibrating objects.</b></p> <p>2P.1.1 Illustrate how sound is produced by vibrating objects and columns of air.</p> <p>2P.1.2 Summarize the relationship between sound and objects of the body that vibrate – eardrum and vocal cords.</p>	<p><b>2P.2 Understand properties of solids and liquids and the changes they undergo.</b></p> <p>2P.2.1 Give examples of matter that change from a solid to a liquid and from a liquid to a solid by heating and cooling.</p> <p>2P.2.2 Compare the amount (volume and weight) of water in a container before and after freezing.</p> <p>2P.2.3 Compare what happens to water left in an open container over time as to water left in a closed container.</p>		
<b>Grade 3</b>	<p><b>3P.1 Understand motion and factors that affect motion.</b></p> <p>3P.1.1 Infer changes in speed or direction resulting from forces acting on an object.</p> <p>3P.1.2 Compare the relative speeds (faster or slower) of objects that travel the same distance in different amounts of time.</p> <p>3P.1.3 Explain the effect of earth's gravity on the motion of any object on or near the earth.</p>	<p><b>3P.2 Understand the structure and properties of matter before and after they undergo a change.</b></p> <p>3P.2.1 Recognize that air is a substance that surrounds us, takes up space and has mass.</p> <p>3P.2.2 Compare solids, liquids, and gases based on their basic properties.</p> <p>3P.2.3 Summarize changes that occur to the observable properties of materials when different degrees of heat are applied to them, such as melting ice or ice cream, boiling water or an egg, or freezing water.</p>	<p><b>3P.3 Recognize how energy can be transferred from one object to another.</b></p> <p>3P.3.1 Recognize that energy can be transferred from one object to another by rubbing them against each other.</p> <p>3P.3.2 Recognize that energy can be transferred from a warmer object to a cooler one by contact or at a distance and the cooler object gets warmer.</p>	
<b>Grade 4</b>	<p><b>4P.1 Explain how various forces affect the motion of an object.</b></p> <p>4P.1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them.</p> <p>4P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion.</p>	<p><b>4P.2 Understand the composition and properties of matter before and after they undergo a change or interaction.</b></p> <p>4P.2.1 Compare the physical properties of samples of matter (strength, hardness, flexibility, ability to conduct heat, ability to conduct electricity, ability to be attracted by magnets, reactions to water and fire).</p> <p>4P.2.2 Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage, and streak.</p> <p>4P.2.3 Classify rocks as metamorphic, sedimentary or igneous based on their composition, how they are formed and the processes that create them.</p>	<p><b>4P.3 Recognize that energy takes various forms that may be grouped based on their interaction with matter.</b></p> <p>4P.3.1 Recognize the basic forms of energy (light, sound, heat, electrical, and magnetic) as the ability to cause motion or create change.</p> <p>4P.3.2 Recognize that light travels in a straight line until it strikes an object or travels from one medium to another, and that light can be reflected, refracted, and absorbed.</p>	
<b>Grade 5</b>	<p><b>5P.1 Understand force, motion and the relationship between them.</b></p> <p>5P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects.</p> <p>5P.1.2 Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel.</p>	<p><b>5P.2 Understand the interactions of matter and energy and the changes that occur.</b></p> <p>5P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including, evaporation, transpiration, condensation, precipitation and runoff).</p> <p>5P.2.2 Compare the weight of an object to the sum of the weight of its parts before and after an interaction.</p>	<p><b>5P.3 Explain how the properties of some materials change as a result of heating and cooling.</b></p> <p>5P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation)</p> <p>5P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications.</p>	

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<b>G</b>	<p>5P.13 Illustrate the motion of an object using a graph to show a change in position over a period of time.</p> <p>5P.14 Predict the effect of a given force or a change in mass on the motion of an object.</p>	<p>5.P.2.3 Summarize properties of original materials, and the new material(s) formed, to demonstrate that a change has occurred.</p>	
<b>Grade 6</b>	<p><b>6P.1 Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound waves.</b></p> <p>6P.1.1 Compare the properties of waves to the wavelike property of energy in earthquakes, light and sound.</p> <p>6P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight.</p> <p>6P.1.3 Explain the relationship among the rate of vibration, the medium through which vibrations travel, sound and hearing.</p>	<p><b>6P.2 Understand the structure, classifications and physical properties of matter.</b></p> <p>6P.2.1 Recognize that all matter is made up of atoms and atoms of the same element are all alike, but are different from the atoms of other elements.</p> <p>6P.2.2 Explain the effect of heat on the motion of atoms through a description of what happens to particles during a change in phase.</p> <p>6P.2.3 Compare the physical properties of pure substances that are independent of the amount of matter present including density, melting point, boiling point and solubility to properties that are dependent on the amount of matter present to include volume, mass and weight.</p>	<p><b>6P.3 Understand characteristics of energy transfer and interactions of matter and energy.</b></p> <p>6P.3.1 Illustrate the transfer of heat energy from warmer objects to cooler ones using examples of conduction, radiation and convection and the effects that may result.</p> <p>6P.3.2 Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature.</p> <p>6P.3.3 Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators).</p>
<b>Grade 7</b>	<p><b>7P.1 Understand motion, the effects of forces on motion and the graphical representations of motion.</b></p> <p>7P.1.1 Explain how the motion of an object by can be described by its position, direction of motion, and speed with respect to some other object.</p> <p>7P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets).</p> <p>7P.1.3 Illustrate the motion of an object using a graph to show a change in position over a period of time.</p> <p>7P.1.4 Interpret distance versus time graphs for constant speed and variable motion.</p>		<p><b>7P.2 Understand forms of energy, energy transfer and transformation and conservation in mechanical systems.</b></p> <p>7P.2.1 Explain how kinetic and potential energy contribute to the mechanical energy of an object.</p> <p>7P.2.2 Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a moving object (roller coaster, pendulum, or cars on ramps as examples).</p> <p>7P.2.3 Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require a complete loop through which an electrical current can pass.</p> <p>7P.2.4 Explain how simple machines such as inclined planes, pulleys, levers and wheel and axles are used to create mechanical advantage and increase efficiency.</p>
<b>Grade 8</b>		<p><b>8P.1 Understand the properties of matter and changes that occur when matter interacts in an open and closed container.</b></p> <p>8P.1.1 Classify matter as elements, compounds, or mixtures based on how the atoms are packed together in arrangements.</p> <p>8P.1.2 Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements.</p> <p>8P.1.3 Compare physical changes such as size, shape and state to chemical changes that are the result of a chemical reaction to include changes in temperature, color, formation of a gas or precipitate.</p> <p>8P.1.4 Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass.</p>	<p><b>8P.2 Explain the environmental implications associated with the various methods of obtaining, managing and using energy resources.</b></p> <p>8P.2.1 Explain the environmental consequences of the various methods of obtaining, transforming, and distributing energy.</p> <p>8P.2.2 Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation.</p>
	<p><b>PSc.1.1 Understand motion in terms of speed, velocity, acceleration and momentum.</b></p> <p>PSc.1.1.1 Explain motion in terms of frame of reference, distance, and displacement.</p> <p>PSc.1.1.2 Compare speed, velocity, acceleration, and momentum using investigations, graphing, scalar quantities and vector quantities.</p> <p><b>PSc.1.2 Understand the relationship between forces and motion.</b></p> <p>PSc.1.2.1 Explain how gravitational force affects the weight of an object and the velocity of an object in freefall.</p>	<p><b>PSc.2.1 Understand types, properties, and structure of matter.</b></p> <p>PSc.2.1.1 Classify matter as: homogeneous or heterogeneous; pure substance or mixture; element or compound; metals, nonmetals or metalloids; solution, colloid or suspension.</p> <p>PSc.2.1.2 Explain the phases of matter and the physical changes that matter undergoes.</p> <p>PSc.2.1.3 Compare physical and chemical properties of various types of matter.</p> <p>PSc.2.1.4 Interpret data presented in Bohr model diagrams and dot diagrams for atoms and ions of elements 1 through 18.</p>	<p><b>PSc.3.1 Understand types of energy, conservation of energy and energy transfer.</b></p> <p>PSc.3.1.1 Explain thermal energy and its transfer.</p> <p>PSc.3.1.2 Explain the law of conservation of energy in a mechanical system in terms of kinetic energy, potential energy and heat.</p> <p>PSc.3.1.3 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 the object.</p> <p>PSc.3.1.4 Explain the relationship among work, power and simple machines both qualitatively and quantitatively</p>

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## Physical Science

<b>Physical Science</b>	<p>PSc.1.2.2 Classify frictional forces into one of four types: static, sliding, rolling, and fluid.</p> <p>PSc.1.2.3 Explain forces using Newton's three laws of motion.</p>	<p><b>PSc.2.2 Understand chemical bonding and chemical interactions.</b></p> <p><b>PSc.2.2.1 Infer valence electrons, oxidation number and reactivity of an element based on its location in the Periodic Table.</b></p> <p>PSc.2.2.2 Infer the type of chemical bond that occurs, whether covalent, ionic or metallic, in a given substance.</p> <p>PSc.2.2.3 Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions.</p> <p>PSc.2.2.4 Exemplify the law of conservation of mass by balancing chemical equations.</p> <p>PSc.2.2.5 Classify types of reactions such as synthesis, decomposition, single replacement or double replacement.</p> <p>PSc.2.2.6 Summarize the characteristics and interactions of acids and bases.</p> <p><b>PSc.2.3 Understand the role of the nucleus in radiation and radioactivity.</b></p> <p><b>PSc.2.3.1 Compare nuclear reactions including; alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission.</b></p> <p>PSc.2.3.2 Exemplify the radioactive decay of unstable nuclei using the concept of half-life.</p>	<p><b>PSc.3.2 Understand the nature of waves.</b></p> <p><b>PSc.3.2.1 Explain the relationships among wave frequency, wave period, wave velocity and wavelength through calculation and investigation.</b></p> <p>PSc.3.2.2 Compare waves (mechanical, electromagnetic, and surface) using their characteristics.</p> <p>PSc.3.2.3 Classify waves as transverse or compressional (longitudinal).</p> <p>PSc.3.2.4 Illustrate the wave interactions of reflection, refraction, diffraction, and interference.</p> <p><b>PSc.3.3 Understand electricity and magnetism and their relationship.</b></p> <p><b>PSc.3.3.1 Summarize static and current electricity.</b></p> <p>PSc.3.3.2 Explain simple series and parallel DC circuits in terms of Ohm's Law.</p> <p>PSc.3.3.3 Explain how current is affected by changes in composition, length, temperature, and diameter of wire.</p> <p><b>PSc.3.3.4 Explain magnetism in terms of domains, interactions of poles, and magnetic fields.</b></p> <p>PSc.3.3.5 Explain the practical applications of magnetism.</p>	
<b>Chemistry</b>		<p><b>Chm.1.1 Analyze the structure of atoms and ions.</b></p> <p>Chm.1.1.1 Analyze the structure of atoms, isotopes, and ions.</p> <p>Chm.1.1.2 Analyze an atom in terms of the location of electrons.</p> <p>Chm.1.1.3 Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model.</p> <p>Chm.1.1.4 Explain the process of radioactive decay by use of nuclear equations and half-life.</p> <p><b>Chm.1.2 Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties.</b></p> <p>Chm.1.2.1 Compare (qualitatively) the relative strengths of ionic, covalent, and metallic bonds.</p> <p>Chm.1.2.2 Infer the type of bond and chemical formula formed between atoms.</p> <p>Chm.1.2.3 Compare inter- and intra- particle forces.</p> <p>Chm.1.2.4 Interpret the name and formula of compounds using IUPAC convention.</p> <p>Chm.1.2.5 Compare the properties of ionic, covalent, metallic, and network compounds.</p> <p><b>Chm.1.3 Understand the physical and chemical properties of atoms based on their position in the Periodic Table.</b></p> <p>Chm.1.3.1 Classify the components of a periodic table (period, group, metal, metalloid, nonmetal, transition).</p> <p>Chm.1.3.2 Infer the physical properties (atomic radius, metallic and nonmetallic characteristics) of an element based on its position on the Periodic Table.</p> <p>Chm.1.3.3 Infer the atomic size, reactivity, electronegativity, and ionization energy of an element from its position in the Periodic Table.</p>	<p><b>Chm.2.1 Understand the relationship among pressure, temperature, volume, and phase.</b></p> <p>Chm.2.1.1 Explain the energetic nature of phase changes.</p> <p>Chm.2.1.2 Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point).</p> <p>Chm.2.1.3 Interpret the data presented in phase diagrams.</p> <p>Chm.2.1.4 Infer simple calorimetric calculations based on the concepts of heat lost equals heat gained and specific heat.</p> <p>Chm.2.1.5 Explain the relationships between pressure, temperature, volume, and quantity of gas, both qualitative and quantitative.</p> <p><b>Chm.2.2 Analyze chemical reactions in terms of quantities, product formation, and energy.</b></p> <p>Chm.2.2.1 Explain the energy content of a chemical reaction.</p> <p>Chm.2.2.2 Analyze the evidence of chemical change.</p> <p>Chm.2.2.3 Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion).</p> <p>Chm.2.2.4 Analyze the stoichiometric relationships inherent in a chemical reaction.</p> <p>Chm.2.2.5 Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and hydrates).</p>	<p><b>Chm.3.1 Understand the factors affecting rate of reaction and chemical equilibrium.</b></p> <p>Chm.3.1.1 Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst).</p> <p>Chm.3.1.2 Explain the conditions of a system at equilibrium.</p> <p>Chm.3.1.3 Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle).</p> <p><b>Chm.3.2 Understand solutions and the solution process.</b></p> <p>Chm.3.2.1 Classify substances using the hydronium and hydroxide ion concentrations.</p> <p>Chm.3.2.2 Summarize the properties of acids and bases.</p> <p>Chm.3.2.3 Infer the quantitative nature of a solution (molarity, dilution, and titration with a 1:1 molar ratio).</p> <p>Chm.3.2.4 Summarize the properties of solutions.</p> <p>Chm.3.2.5 Interpret solubility diagrams.</p> <p>Chm.3.2.6 Explain the solution process.</p>
	Phy.1.1 Analyze the motion of objects.		<p><b>Phy.2.1 Understand the concepts of work, energy and power, as well as, the relationship among them.</b></p>	Phy.3.1 Explain charges and electrostatic systems.

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<b>Physics</b>	<p>Phy.1.1.1 Analyze motion graphically and numerically using vectors, graphs and calculations.</p> <p>Phy.1.1.2 Analyze motion in one dimension using time, distance, displacement, velocity and acceleration.</p> <p>Phy.1.1.3 Analyze motion in two dimensions using angle of trajectory, time, distance, displacement, velocity and acceleration.</p> <p><b>Phy.1.2 Analyze systems of forces and their interaction with matter.</b></p> <p>Phy.1.2.1 Analyze forces and systems of forces graphically and numerically using vectors, graphs and calculations.</p> <p>Phy.1.2.2 Analyze systems of forces in one dimension and two dimensions using free body diagrams.</p> <p>Phy.1.2.3 Explain forces using Newton's laws of motion as well as the universal law of gravitation.</p> <p>Phy.1.2.4 Explain the effects of forces (including weight, normal, tension, and friction) on objects.</p> <p>Phy.1.2.5 Analyze basic forces related to rotation in a circular path (centripetal force).</p> <p><b>Phy.1.3 Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy and impulse.</b></p> <p>Phy.1.3.1 Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the principles of conservation of momentum and conservation of energy.</p> <p>Phy.1.3.2 Analyze the motion of objects based on the relationship between momentum and impulse.</p>	<p>Phy.2.1.1 Interpret data on work and energy presented graphically and numerically.</p> <p>Phy.2.1.2 Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of objects.</p> <p>Phy.2.1.3 Explain the relationship among work, power and energy.</p> <p><b>Phy.2.2 Analyze the behavior of waves.</b></p> <p>Phy.2.2.1 Analyze how energy is transmitted through waves, using the fundamental characteristics of waves: wavelength, period, frequency, amplitude, and wave velocity.</p> <p>Phy.2.2.2 Analyze wave behaviors in terms of transmission, reflection, refraction and interference.</p> <p>Phy.2.2.3 Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically sound and light).</p> <p><b>Phy.2.3 Analyze the nature of moving charges and electric circuits.</b></p> <p>Phy.2.3.1 Explain Ohm's law in relation to electric circuits.</p> <p>Phy.2.3.2 Differentiate the behavior of moving charges in conductors and insulators.</p> <p>Phy.2.3.3 Compare the general characteristics of AC and DC systems without calculations.</p> <p>Phy.2.3.4 Analyze electric systems in terms of their energy and power.</p> <p>Phy.2.3.5 Analyze systems with multiple potential differences and resistors connected in series and parallel circuits, both conceptually and mathematically, in terms of voltage, current and resistance.</p>	<p>Phy.3.1.1 Explain qualitatively the fundamental properties of the interactions of charged objects.</p> <p>Phy.3.1.2 Explain the geometries and magnitudes of electric fields.</p> <p>Phy.3.1.3 Explain how Coulomb's law relates to the electrostatic interactions among charged objects.</p> <p>Phy.3.1.4 Explain the mechanisms for producing electrostatic charges, including charging by friction, conduction, and induction.</p> <p>Phy.3.1.5 Explain how differences in electrostatic potentials relate to the potential energy of charged objects.</p> <p><b>Phy.3.2 Explain the concept of magnetism.</b></p> <p>Phy.3.2.1 Explain the relationship between magnetic domains and magnetism.</p> <p>Phy.3.2.2 Explain how electric currents produce various magnetic fields.</p> <p>Phy.3.2.3 Explain how transformers and power distributions are applications of electromagnetism.</p>
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