

**Arizona High School Science
Science Contents Standards Mapping**

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Strand 5: Physical Science	Boardworks High School Physics Presentation
Concept 1: Structure and Properties of Matter - Understand physical, chemical, and atomic properties of matter.	
PO 1. Describe substances based on their physical properties.	<i>See Boardworks High School Chemistry for relevant presentations.</i>
PO 2. Describe substances based on their chemical properties.	
PO 3. Predict properties of elements and compounds using trends of the periodic table (e.g., metals, non-metals, bonding – ionic/covalent).	
PO 4. Separate mixtures of substances based on their physical properties	
PO 5. Describe the properties of electric charge and the conservation of electric charge.	
PO 6. Describe the following features and components of the atom:	
protons	
neutrons	
electrons	
mass	
number and type of particles	
structure	
organization	
PO 7. Describe the historical development of models of the atom.	
PO 8. Explain the details of atomic structure (e.g., electron configuration, energy levels, isotopes).	
Concept 2: Motions and Forces - Analyze relationships between forces and motion.	
PO 1. Determine the rate of change of a quantity (e.g., rate of erosion, rate of reaction, rate of growth, velocity).	Speed and Velocity
PO 2. Analyze the relationships among position, velocity, acceleration, and time, graphically and mathematically	Displacement, Velocity and Acceleration
PO 3. Explain how Newton's 1st Law applies to objects at rest or moving at constant velocity.	Newton's First Law
PO 4. Using Newton's 2nd Law of Motion, analyze the relationships among the net force acting on a body, the mass of the body, and the resulting acceleration: graphically and mathematically	Newton's Second Law
PO 5. Use Newton's 3rd Law to explain forces as interactions between bodies (e.g., a table pushing up on a vase that is pushing down on it; an athlete pushing on a basketball as the ball pushes back on her).	Newton's Third Law
PO 6. Analyze the two-dimensional motion of objects by using vectors and their components.	Vectors and Scalars

PO 7. Give an example that shows the independence of the horizontal and vertical components of projectile motion.	Projectiles
PO 8. Analyze the general relationships among force, acceleration, and motion for an object undergoing uniform circular motion.	Circular Motion
PO 9. Represent the force conditions required to maintain static equilibrium.	–
PO 10. Describe the nature and magnitude of frictional forces.	Friction
PO 11. Using the Law of Universal Gravitation, predict how the gravitational force will change when the distance between two masses changes or the mass of one of them changes.	–
PO 12. Using Coulomb's Law, predict how the electrical force will change when the distance between two point charges changes or the charge of one of them changes.	–
PO 13. Analyze the impulse required to produce a change in momentum.	Changes in Momentum Momentum
PO 14. Quantify interactions between objects to show that the total momentum is conserved in both collision and recoil situations.	Conservation of Momentum
Concept 3: Conservation of Energy and Increase in Disorder - Understand ways that energy is conserved, stored, and transferred.	
PO 1. Describe the following ways in which energy is stored in a system:	
mechanical	Conservation of Energy Conservation of Momentum
electrical	Energy Transfers
chemical	
nuclear	Nuclear Fusion Nuclear Fission
PO 2. Describe various ways in which energy is transferred from one system to another (e.g., mechanical contact, thermal conduction, electromagnetic radiation.)	Conduction and Convection Electromagnetic Waves
PO 3. Recognize that energy is conserved in a closed system.	Conservation of Energy
PO 4. Calculate quantitative relationships associated with the conservation of energy.	Conservation of Energy
PO 5. Analyze the relationship between energy transfer and disorder in the universe (2nd Law of Thermodynamics).	–
PO 6. Distinguish between heat and temperature.	–
PO 7. Explain how molecular motion is related to temperature and phase changes.	Changing State Particles in Action
Concept 4: Chemical Reactions - Investigate relationships between reactants and products in chemical reactions.	
PO 1. Apply the law of conservation of matter to changes in a system.	

PO 2. Identify the indicators of chemical change, including formation of a precipitate, evolution of a gas, color change, absorption or release of heat energy.		
PO 3. Represent a chemical reaction by using a balanced equation.		
PO 4. Distinguish among the types of bonds (i.e., ionic, covalent, metallic, hydrogen bonding).		
PO 5. Describe the mole concept and its relationship to Avogadro's number.		
PO 6. Solve problems involving such quantities as moles, mass, molecules, volume of a gas, and molarity using the mole concept and Avogadro's number.		
PO 7. Predict the properties (e.g., melting point, boiling point, conductivity) of substances based upon bond type.	<i>See Boardworks High School Chemistry for relevant presentations.</i>	
PO 8. Quantify the relationships between reactants and products in chemical reactions (e.g., stoichiometry, equilibrium, energy transfers).		
PO 9. Predict the products of a chemical reaction using types of reactions (e.g., synthesis, decomposition, replacement, combustion).		
PO 10. Explain the energy transfers within chemical reactions using the law of conservation of energy.		
PO 11. Predict the effect of various factors (e.g., temperature, concentration, pressure, catalyst) on the equilibrium state and on the rates of chemical reaction.		
PO 12. Compare the nature, behavior, concentration, and strengths of acids and bases.		
PO 13. Determine the transfer of electrons in oxidation/reduction reactions.		
Concept 5: Interactions of Energy and Matter - Understand the interactions of energy and matter.		
PO 1. Describe various ways in which matter and energy interact (e.g., photosynthesis, phase change).		–
PO 2. Describe the following characteristics of waves: wavelength, frequency, period and amplitude		Waves
PO 3. Quantify the relationships among the frequency, wavelength, and the speed of light.	Transverse Waves	
PO 4. Describe the basic assumptions of kinetic molecular theory.	–	
PO 5. Apply kinetic molecular theory to the behavior of matter (e.g., gas laws).	–	
PO 6. Analyze calorimetric measurements in simple systems and the energy involved in changes of state.	–	
PO 7. Explain the relationship between the wavelength of light absorbed or released by an atom or molecule and the transfer of a discrete amount of energy.	Observing Line Spectra	
PO 8. Describe the relationship among electric potential, current, and resistance in an ohmic system.	Current, Voltage and Resistance Current and Potential Difference Factors Affecting Resistance 1 Factors Affecting Resistance 2	
PO 9. Quantify the relationships among electric potential, current, and resistance in an ohmic system.	Current, Voltage and Resistance	