New Jersey Science Curriculum for Science
Content Standards Mapping

PHYSICAL SCIENCE	Boardworks High School Chemistry Presentations
5.2 Physical Science. All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.	
A. Properties of Matter: All objects and substances in the natural world are composed of matter. Matter has two fundamental properties: matter takes up space, and matter has inertia.	
5.2.12.A.1 - Electrons, protons, and neutrons are parts of the atom and have measurable properties, including mass and, in the case of protons and electrons, charge. The nuclei of atoms are composed of protons and neutrons. A kind of force that is only evident at nuclear distances holds the particles of the nucleus together against the electrical repulsion between the protons.	Atomic Structure Introducing Atoms
5.2.12.A.2 - Differences in the physical properties of solids, liquids, and gases are explained by the ways in which the atoms, ions, or molecules of the substances are arranged, and by the strength of the forces of attraction between the atoms, ions, or molecules.	Changing States Particles in Action
5.2.12.A.3 - In the Periodic Table, elements are arranged according to the number of protons (the atomic number). This organization illustrates commonality and patterns of physical and chemical properties among the elements.	Electron Structure and the Periodic Table Patterns of Behaviour The Periodic Table
5.2.12.A.4 - In a neutral atom, the positively charged nucleus is surrounded by the same number of negatively charged electrons. Atoms of an element whose nuclei have different numbers of neutrons are called isotopes.	Isotopes
5.2.12.A.5 Solids, liquids, and gases may dissolve to form solutions. When combining a solute and solvent to prepare a solution, exceeding a particular concentration of solute will lead to precipitation of the solute from the solution. Dynamic equilibrium occurs in saturated solutions. Concentration of solutions can be calculated in terms of molarity, molality, and percent by mass.	Percentage Composition by Mass Solubility Solutions What are Moles?
5.2.12.A.6 Acids and bases are important in numerous chemical processes that occur around us, from industrial to biological processes, from the laboratory to the environment.	Neutralization pH and Indicators Properties of Acids and Alkalis
B. Changes in Matter: Substances can undergo physical or chemical changes to form new substances. Each change involves energy.	

5.2.12.B.1 An atom's electron configuration, particularly of the outermost electrons, determines how the atom interacts with other atoms. Chemical bonds are the interactions between atoms that hold them together in molecules or between oppositely charged ions.	Comparing Bonding Covalent Bonding Electron Configuration Electron Structure and the Periodic Table Ionic Bonding Why do Atoms Form Bonds?
5.2.12.B.2 A large number of important reactions involve the transfer of either electrons or hydrogen ions between reacting ions, molecules, or atoms. In other chemical reactions, atoms interact with one another by sharing electrons to create a bond.	Comparing Bonding Covalent Bonding Ionic Bonding Why do Atoms form Bonds?
5.2.12.B.3 The conservation of atoms in chemical reactions leads to the ability to calculate the mass of products and reactants using the mole concept.	Conservation of Mass Gases and Moles Molar Mass What are Moles?
C. Forms of Energy: Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, the natural world can be explained and is predictable.	
5.2.12.C.1 Gas particles move independently and are far apart relative to each other. The behavior of gases can be explained by the kinetic molecular theory. The kinetic molecular theory can be used to explain the relationship between pressure and volume, volume and temperature, pressure and temperature, and the number of particles in a gas sample. There is a natural tendency for a system to move in the direction of disorder or entropy.	Ideal Gas Laws Particles in Action
5.2.12.C.2 Heating increases the energy of the atoms composing elements and the molecules or ions composing compounds. As the kinetic energy of the atoms, molecules, or ions increases, the temperature of the matter increases. Heating a pure solid increases the vibrational energy of its atoms, molecules, or ions. When the vibrational energy of the molecules of a pure substance becomes great enough, the solid melts.	Changing State Particles in Action Temperature and Reaction Rate
D. Energy Transfer and Conservation: The conservation of energy can be demonstrated by keeping track of familiar forms of energy as they are transferred from one object to another.	
5.2.12.D.1 The potential energy of an object on Earth's surface is increased when the object's position is changed from one closer to Earth's surface to one farther from Earth's surface.	–
5.2.12.D.2 The driving forces of chemical reactions are energy and entropy. Chemical reactions either release energy to the environment (exothermic) or absorb energy from the environment (endothermic).	Bonds and Activation Energy Endothermic Reactions Exothermic Reactions
5.2.12.D.3 Nuclear reactions (fission and fusion) convert very small amounts of matter into energy.	Nuclear Fission Nuclear Fusion

5.2.12.D.4 Energy may be transferred from one object to another during collisions.	–
5.2.12.D.5 Chemical equilibrium is a dynamic process that is significant in many systems, including biological, ecological, environmental, and geological systems. Chemical reactions occur at different rates. Factors such as temperature, mixing, concentration, particle size, and surface area affect the rates of chemical reactions.	Concentration, Pressure and Reaction Rates Dynamic Equilibrium Equilibrium - Changing Conditions Rates of Reaction Surface Area, Catalysts and Reaction Rates Temperature and Reaction Rates The Haber Process
E. Forces and Motion: It takes energy to change the motion of objects. The energy change is understood in terms of forces.	
5.2.12.E.1 The motion of an object can be described by its position and velocity as functions of time and by its average speed and average acceleration during intervals of time.	–
5.2.12.E.2 Objects undergo different kinds of motion (translational, rotational, and vibrational).	–
5.2.12.E.3 The motion of an object changes only when a net force is applied.	–
5.2.12.E.4 The magnitude of acceleration of an object depends directly on the strength of the net force, and inversely on the mass of the object. This relationship (a=Fnet/m) is independent of the nature of the force.	–