PLAINFIELD HIGH SCHOOL CHEMISTRY CURRICULUM

2016-2017

Philosophy

With the ever-increasing need for innovators, problem finders, and designers of materials, pharmaceuticals, and even new fuels, comes the need for individuals skilled in the science practices and knowledgeable about chemistry. Chemistry course provides students with training for such knowledge and skills through guided inquiry labs, a more focused curriculum on content relevant to today's problems, and an exam that assesses students' mental models of the particulate nature of matter instead of memorization of rules to understand chemistry.

All PHS students will develop good questioning skills to become critical & scientific thinkers, in a safe and caring environment in alignment with the New Jersey Core Content Standards for Science.

Textbook: Pearson Chemistry , **(*Wilbraham, Staley, Matta, Waterman Edition*-2012)**

New Jersey Core Curriculum Content Standards in Science

The following standards have been covered within this curriculum: 09 NJCCCS

5.1 Science Practices

All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.

A. Understand Scientific Explanations: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.
5.1.12.A.1 Mathematical, physical, and computational tools are used to search for and explain core scientific concepts and principles.
5.1.12.A.2 Interpretation and manipulation of evidence-based models are used to build and critique arguments/explanations.
5.1.12.A.3 Revisions of predictions and explanations are based on systematic observations, accurate measurements, and structured data/evidence.

B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.
5.1.12.B.1 Logically designed investigations are needed in order to generate the evidence required to build and refine models and explanations.
5.1.12.B.2 Mathematical tools and technology are used to gather, analyze, and communicate results.
5.1.12.B.3 Empirical evidence is used to construct and defend arguments.

5.1.12.B.4 Scientific reasoning is used to evaluate and interpret data patterns and scientific conclusions.

C. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.
5.1.12.C.1 Refinement of understandings, explanations, and models occurs as new evidence is incorporated.
5.1.12.C.2 Data and refined models are used to revise predictions and explanations.
5.1.12.C.3 Science is a practice in which an established body of knowledge is continually revised, refined, and extended as new evidence emerges.

D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which are social practices that are governed by a core set of values and norms.
5.1.12.D.1 Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.
5.1.12.D.2 Science involves using language, both oral and written, as a tool for making thinking public.
5.1.12.D.3 Ensure that instruments and specimens are properly cared for and that animals, when used, are treated humanely, responsibly, and ethically.

5.2 (Physical Science)Chemistry

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.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).

5.2.12.D.3 Nuclear reactions (fission and fusion) convert very small amounts of matter into energy.

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.

Enduring Understandings(Big Ideas)	
Chemistry:	Chemistry is essential to understand the physical and biological world.
Lab Safety:	Potential hazards are mitigated by following directions and Careful technique.
Scientific Method:	The scientific method is a databased logical approach to problem solving.
Metric System	The metric system is a worldwide measurement system based on powers of ten.
Percent Error	Precision of measurement and lab technique influence the Relative (percent) error.
Dimensional Analysis	Dimensional analysis is a unit-based logical approach to problem solving.
Significant Figures	Significant figures limit the degree of reportable precision and the validity of results.
Scientific Notation	Very large and very small numbers can be written concisely using powers of 10.
Measurement	Accuracy and precision and units are important to achieve correct results.
Types of Matter	Differences between elements, compounds and mixtures.
	Symbols, Names Communication has been established by the use of symbol and & Formulas nomenclature systems to make the understanding of chemistry uniform among scientists.
Properties	Intensive properties are substance specific and extensive depend on the size of the sample.
Periodic Table	The periodic table reveals patterns and relationships between

	atoms and elements. These relationships can be explained by examining subatomic arrangements of particles.
Atomic Theory	The atomic theory is evolving to explain past as well as Current experimental results.
The Mole	The mole is an essential concept to understanding the mechanisms of chemistry.
Conservation of Mass	The amount of matter in the universe is essentially constant. It is only rearranged.
Stoichiometry	Role of the mole in chemical calculations, and application of dimensional analysis in their solutions.
States of Matter	The phases of matter are determined by the proximity of molecules and energy involved in their changes.
Thermochemistry	Energy is transferred in chemical and physical reactions.
Gas Laws	Pressure, temperature, number of particles, and volume are interrelated. Behavior of gases is governed by equations called "gas laws."
Thermodynamics	Energy and randomness are the two driving forces of change.
Kinetics	The importance of molecular collision frequency in rates of Chemical reactions. A successful collision requires proper orientation of particles and sufficient energy.
Equilibrium	Some reactions can occur both forward and backward, at the same rate. An equilibrium system will respond to stress; shift and find a new balance. Experimental conditions can nfluence the amount of a substance produced in an equilibrium eaction.
Acid-Base	Acids and bases are chemical opposites and can neutralize each other. pH is a logarithmic scale that describes the concentration of H+ ions.
Redox	Oxidation and reduction are opposite reactions and always Occur together. Applied electricity can be used to force non-Spontaneous reactions to occur. Spontaneous redox reactions can be used to produce electricity.
Bonding	The types of bonds a substance has influences its chemical and physical properties. Electron arrangement in a molecule can be used to predict molecular shapes.
Organic Chemistry	Organic compounds contain one or more of the following elements: O, H, N, S, P. Isomers are differing arrangements of the same atoms. Functional groups determine chemical properties of organic substances.

21st Century Connections Cross Curricular

Biology- chemical bonding
Physics- isotopes
Psychology-neuroscience on a molecular level
Mathematics- graphing, dimensional analysis, simple equations
History- scientists and the effects of discoveries on society
Technology- molecular modeling, power point presentations

Character Education

• Honesty: Students are expected to adhere to the integrity code of the high school. Students are expected to give honest effort on all assignments.
• Respect: Students are expected to treat all members of the classroom with courtesy and respect.
• Service: Students are expected to maintain a safe and clean environment in the classroom and the lab.
• Responsibility: Students are expected to take responsibility for their own actions. Students are expected to do their best and learn.

Career As per the NJCCCS

9.1.B Students will communicate and comprehend written and verbal thoughts, ideas, directions, and information relative to educational and occupational settings.
Students will select and utilize appropriate technology in the design and implementation of teacher-approved projects relevant to occupations and/or higher educational settings.
9.2.A Students will apply communications and data analysis to the problem-solving and decision making processes in a variety of life situations. Students will apply the use of symbols, pictures, graphs, objects, and other visual information to a selected project in academic and/or occupational settings.
9.2.C Students will model interpersonal and effective conflict resolution skills.
Students will communicate effectively in a variety of settings with a diverse group of people.
9.2.D Discuss consequences and sanctions when on-the-job rules and laws are not followed.
9.2.F Engage in an informed discussion about rules and laws designed to promote safety and health.
Describe and demonstrate basic first aid and safety procedures.
Practice the safe use of tools and equipment.
Implement safety procedures in the classroom and workplace, where appropriate.

Technology As per the NJCCCS

8.1.12.A.2 Produce and edit a multi-page document for a commercial or professional audience using desktop publishing and/or graphics software.
8.2.12.C.2 Evaluate ethical considerations regarding the sustainability of resources that are used for the design, creation, and maintenance of a chosen product.
8.2 Technology (Engineering and Design) Electronic balances, digital thermometers, spectronic 20's I-pads and computers are used throughout the year.

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