

# Pequannock Township School District

## Curriculum Syllabus

Course Name and level / Grade level and Subject:  
Academic Chemistry, Grade 10

### Course Description:

This lab-based, inquiry-instructed course is aligned to the Next Generation Science Standards and the Common Core State Standards. This course deals with major concepts and theories of chemistry. Students develop an understanding of matter in terms of composition and changes in composition, and become able to solve scientific problems logically, use and write chemical formulae, as well as, write and balance chemical equations. This course will cover topics such as: Properties and State of Matter, Atomic Theory, the Periodic Table, Chemical Bonding, Representing Chemical Substances, Solution Chemistry, and Equilibrium and Reaction Rates.

### Course Standards:

The following is a list of NJSLS that describe what students are expected to know and be able to do as a result of successfully completing this course. The following NJSLS are the basis of the assessment of student achievement. The learner will demonstrate mastery of:

Units of Study	NGSS
<b>Unit Plan 1:</b> <b>Properties and States of Matter</b>	HS-PS1-3 HS-PS1-1 HS-PS1-8 HS-PS2-6
<b>Unit Plan 2:</b> <b>Atomic Theory</b>	HS-PS1-1 HS-PS4-1 HS-PS4-3

<p><b>Unit Plan 3:</b></p> <p><b>The Periodic Table</b></p>	<p>HS-PS1-1  HS-PS1-2  HS-PS1-3  HS -PS2-6</p>
<p><b>Unit Plan 4:</b></p> <p><b>Chemical Bonding &amp; Nomenclature</b></p>	<p>HS-PS1-2  HS-PS1-3  HS-PS1-4  HS-PS2-6</p>
<p><b>Unit Plan 5:</b></p> <p><b>Representing Chemical Substance</b></p>	<p>HS-PS1-2  HS-PS1-4  HS-PS1-6  HS-PS1-7</p>
<p><b>Unit Plan 6:</b></p> <p><b>Chemical Reactions &amp; Stoichiometry</b></p>	<p>HS-PS1-2  HS-PS1-4  HS-PS1-6  HS-PS1-7</p>
<p><b>Unit Plan 7 :</b></p> <p><b>Gas Laws</b></p>	<p>HS-PS1-2  HS-PS1-5  HS-PS1-6</p>
<p><b>Unit Plan 8 :</b></p> <p><b>Solution Chemistry</b></p>	<p>HS-PS1-2  HS-PS1-5  HS-PS1-6</p>

## Scope and Sequence

<p><b>Unit 1: Properties and States of Matter</b></p>
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Chemistry is the study of the behavior of various types of matter. Students will differentiate among the different types of matter and identify the physical and chemical changes such matter goes through. The students will differentiate between a physical change in matter and a chemical change of matter. Changes in matter can be written using chemical symbols when writing chemical reactions. Students will write various types of chemical reactions using such symbols.

### **Unit 2: Atomic Theory**

Many scientists have contributed to the development of the Atomic Model. Each scientist used discoveries by their predecessors to improve the Atomic Model. The current view of the atom still contains some of the same elements of models before it. The Quantum Model of the atom describes how electrons are organized around the atom. Each atom consists of protons, neutrons, and electrons. Some atoms of the same element vary by the number of neutrons they contain. Neutral atoms have the same number of protons and electrons while ions do not. Ions are atoms with an electrical charge.

### **Unit 3: The Periodic Table**

The Periodic Table organizes the elements based on atomic number and chemical properties. Characteristics of elements can be inferred based on the location of the element within the Periodic Table. There are also trends of atomic radii, ionization energy, and electronegativity that can be used to explain the chemical behavior of the elements.

### **Unit 4: Chemical Bonding & Formulas/Nomenclature**

The atoms of solid ionic compounds are arranged in an orderly fashion. The crystalline structure of these solids is the result of ionic bonding between atoms. Ionic bonding gives ionic compounds their unique physical properties. Molecular compounds consists of two or more nonmetallic atoms bound by a covalent bond. There are many variations of molecular compounds because of the chemical bonding found within the molecules. The Octet Rule governs how atoms are bound and arranged within a molecular compound. Molecular compounds may have an even or uneven distribution of electrons within the molecule. This distribution of electrons within the molecule determines its shape, which in turn, affect the physical properties of molecular substances.

### **Unit 5: Representing Chemical Substances**

Naming and writing chemical compounds must be approached in a systematic way. The concept of the mole enable scientists to measure the mass, volume, and number of particles of a substance. The mole was developed as a tool to relate the number of particles of a substance to its mass and volume. Dimensional Analysis is used in order to perform these conversions.

### **Unit 6: Chemical Reactions and Stoichiometry**

Students will learn to predict the products and write five classes of chemical reactions; synthesis reactions, decomposition reactions, combustion reactions, single replacement reactions, and double replacement reactions.

Stoichiometry is the science of the quantification of matter in chemical reactions. The mole concept and Dimensional Analysis is used to quantify the substances involved in chemical reactions.

### **Unit 7: Behavior of Gases**

Gas behavior is explained using the Kinetic Molecular Theory. The volume, temperature, pressure, and moles of gas particles are related. The Gas Laws can be used to quantify the effect of volume, temperature, pressure, and moles of gas particles. The students will use Boyle's Law, Charles' Law, Combined Gas Law, Gay-Lussac's Law, the Ideal Gas Law, Dalton's Law of Partial Pressure's, and Graham's Law to describe the behavior of gases.

### **Unit 8: Solution Chemistry**

Acids and bases are chemical compounds that have very different chemical and physical properties. There are many acid and base chemical reactions that occur in the environment that we live. Acids donate hydrogen ions in water while bases receive them. The strength of an acid or base may be measured using the pH scale. A neutralization reaction occurs when an acid reacts with a base to produce a salt and water. An indicator may be used to signal that a neutralization reaction has occurred. Titrations are performed and used to calculate the concentration of an acid or a base. Strong acids dissociate almost completely in water while weak bases only partially dissociation. The same is true for strong and weak bases. The strength of an acid or base can be determined by analyzing the dissociation constant of each. Buffers are solutions of weak acids or bases that can resist changes in pH if an acid or base is added. Some salts can hydrolyze in water to form an acidic or basic solution.

## **Assessments**

Evaluation of student achievement in this course will be based on the following:

- a. *Observational data collected by teachers as students are learning*

- b. *Formative assessments given by teachers to gauge progress toward each standard*
- c. *Quizzes,*
- d. *Unit tests*
- e. *Lab data and calculations*
- f. *Lab reports with data analysis and conclusion*
- g. *Writing prompts for CER responses*
- h. *Modelling activities*

## Curriculum Resources

### **Anchor Programs/Teacher Materials**

<http://google.discoveryeducation.com/> (student login required for access)

*Prentice Hall Chemistry*

## Home and School Connection

The following are suggestions and/or resources that will help parents support their children:

- <http://www.bozemanscience.com/chemistry>
- <https://www.khanacademy.org/science/chemistry>
- <https://www.chemteam.info/ChemTeamIndex.html>
- <http://www.gpb.org/chemistry-study-of-matter/students/chemistry/semester1>  
*Videos and note-taking guides for every unit with supplemental materials*