

Pequannock Township School District

Curriculum Syllabus

Course Name and level / Grade level and Subject:
Honors 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.

Chemistry is a foundational branch of science that seeks to define and explain the physical environment and the reactions and interactions of the atoms that compose that environment. Chemistry provides the basis for understanding many other processes that are critical to man's understanding of nature of the universe and manipulation of his environment, including the following; matter and the changes it undergoes, scientific measurements, properties of the atom, chemical bonding, chemical quantities, and chemical reactions.

This course is intended to provide an introduction and foundation for the student to the aforementioned issues and areas of contemporary study.

Course Standards:

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

Unit of Study	NGSS
Unit Plan 1:	HS-PS1-3 HS-PS1-1 HS-PS1-8

Properties and States of Matter	HS-PS2-6
Unit Plan 2: Atomic Theory	HS-PS1-1 HS-PS4-1 HS-PS4-3
Unit Plan 3: The Periodic Table	HS-PS1-1 HS-PS1-2 HS-PS1-3 HS-PS2-6
Unit Plan 4: Chemical Bonding & Nomenclature	HS-PS1-2 HS-PS1-3 HS-PS1-4 HS-PS2-6
Unit Plan 5: Representing Chemical Substance	HS-PS1-2 HS-PS1-4 HS-PS1-6 HS-PS1-7
Unit Plan 6: Chemical Reactions & Stoichiometry	HS-PS1-2 HS-PS1-4 HS-PS1-6 HS-PS1-7
Unit Plan 7 : Gas Laws	HS-PS1-2 HS-PS1-5 HS-PS1-6
Unit Plan 8 : Solution Chemistry	HS-PS1-2 HS-PS1-5 HS-PS1-6

Unit Plan 9: Thermochemistry and Thermodynamics	HS-PS3-3 HS-PS3-4
Unit Plan 10: Equilibrium & Reaction Rates	HS-PS1-5 HS-PS1-6
Unit Plan 11: Acid Base Chemistry	HS-PS1-2 HS-PS1-5 HS-PS1-6

Scope and Sequence

Unit 1 (15 days)

Properties and States of Matter

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 (15 days)

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 (15 days)

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 (18 days)

Chemical Bonding & 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 (15 days)

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 to 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 (20 days)

Chemical Reactions & 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 (15 days)

Gas Laws

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 (15 days)

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.

Unit 9 (15 days)

Thermochemistry and Thermodynamics

Energy can be transferred from one object to another. Scientists can measure such energy transfer in an experimental setting by utilizing the science of Calorimetry. The Kinetic Molecular Theory can explain energy transfer on the molecular level. Some chemical reactions produce heat while others absorb energy. Scientists can predict the amount of energy absorbed or released in a chemical reaction by using the standard heat of formation of the reactant and products or using Hess' Law. The amount of energy transferred in a chemical reaction is called the enthalpy of reaction. Enthalpy changes also occur during changes of state. The enthalpy change and entropy change of a chemical reaction can be used to predict the spontaneity of a chemical reaction.

Unit 10 (12 days)

Equilibrium & Reaction Rates

Students will examine the four factors that affect the rate of a chemical reaction. Most chemical reactions reach a state called equilibrium where the rate of formation of the products

is equal to the rate of reformation of the reactants. One can predict whether the product or reactants are favored at chemical equilibrium by evaluating the Equilibrium Constant of a chemical reaction. Some chemical reactions occur spontaneously while other do not. The enthalpy and entropy of a chemical reaction affect the overall spontaneity of such chemical reactions.

Unit 11 (15 days)

Acid Base Chemistry

Students will examine the four factors that affect the rate of a chemical reaction. Most chemical reactions reach a state called equilibrium where the rate of formation of the products is equal to the rate of reformation of the reactants. One can predict whether the product or reactants are favored at chemical equilibrium by evaluating the Equilibrium Constant of a chemical reaction. Some chemical reactions occur spontaneously while other do not. The enthalpy and entropy of a chemical reaction affect the overall spontaneity of such chemical reactions.

Assessments

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

- a. *Quizzes,*
- b. *Unit tests*
- c. *Lab data and calculations*
- d. *Lab reports with data analysis and conclusion*
- e. *Writing prompts for CER responses*
- f. *Modelling activities*

Curriculum Resources

Anchor Programs/Teacher Materials

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