Chemistry Curriculum

This curricula and accompanying instructional materials have been developed to align with the NJSLS and in accordance with the NJ Department of Education's guidelines to include: Curriculum designed to meet grade level expectations, integrated accommodations and modifications for students with IEPs, 504s, ELLs, and gifted and talented students, assessments including benchmarks, formative, summative, and alternative assessments, a list of core instructional and supplemental materials, pacing guide, interdisciplinary connections, integration of 21st century skills, integration of technology, and integration of 21st Century Life and Career standards.

About the Standards

In 1996, the New Jersey State Board of Education adopted the state's first set of academic standards called the Core Curriculum Content Standards. The standards described what students should know and be able to do upon completion of a thirteen-year public school education. Over the last twenty years, New Jersey's academic standards have laid the foundation for local district curricula that is used by teachers in their daily lesson plans.

Revised every five years, the standards provide local school districts with clear and specific benchmarks for student achievement in nine content areas. Developed and reviewed by panels of teachers, administrators, parents, students, and representatives from higher education, business, and the community, the standards are influenced by national standards, research-based practice, and student needs. The standards define a "Thorough and Efficient Education" as guaranteed in 1875 by the New Jersey Constitution. Currently the standards are designed to prepare our students for college and careers by emphasizing high-level skills needed for tomorrow's world.

The New Jersey Student Learning Standards include Preschool Teaching and Learning Standards, as well as nine K-12 standards for the following content areas: **21st Century Life and Careers, Comprehensive Health and Physical Education, English Language Arts, Mathematics, Science, Social Studies, Technology, Visual and Performing Arts, World Languages**

The most recent review and revision of the standards occurred in 2014. However, the standards in language arts and math underwent an additional review in 2015 with adoption by the New Jersey State Board of Education in May 2016.

Lower Cape May Regional School District (Chemistry) Curriculum	
Content Area: Science	
Course Title: Chemistry	**Grade level: 10-12**
Unit 1: Matter and Change	**September to October - 6 weeks**
Unit 2: The Atom	**October to November - 4 weeks**
Unit 3: Arrangement of Electrons in Atoms	**November to December – 4 weeks**
Unit 4: Periodic Law	**December to January – 4 weeks**
Unit 5: Chemical Bonding	**January to February - 4 weeks**
Unit 6: Chemical Formula and Chemical Compounds/ The Mole	**February to March – 5 weeks**
Unit 7: Chemical Equations and Reactions/Stoichiometry	**March to April – 5 weeks**
Unit 8: States of Matter and Solutions	**April – 3 weeks**
Unit 9: Acids and Bases	**April to May -3 weeks**

Unit 10: Nuclear Chemistry	**May to June – 2 weeks**
Date Created: August 2020	**Board Approved On: 9/24/20**

Lower Cape May Regional School District Chemistry Curriculum Unit 1 Overview
Content Area: Science
Unit Title: Matter and Change
Target Course/Grade Level: Chemistry/10-12

Unit Summary:
• Define Chemistry
  o List examples of branches of Chemistry
  o Compare and Contrast Basic Research, Applied Research, and technological development.
• Laboratory Environment
  o Lab safety
  o Lab Equipment
• Methods of study
  o Scientific Method
  o CER
  o Engineering Method
• Measurements and Math
  o Metric Prefixes
  o SI Units
  o Derived units - volume and density
  o Conversion math
  o Accuracy and Precision
  o Percent Error
• Classify matter
• Organization of matter
• Pure substances vs mixtures
• Physical and chemical properties
  o Intensive vs extensive

- physical vs chemical change
- Elements
  - Use periodic table to name elements and symbols
  - Describe arrangement of periodic table
  - List characteristics of metals, nonmetals, and metalloids

Interdisciplinary Connections:

Literacy and Math

- **RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- **SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
- **N-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **N-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.
- **N-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

21st Century Themes, Skills, and Standards:

- **CRP2**. Apply appropriate academic and technical skills.
- **CRP4.** Communicate clearly and effectively and with reason.
- **CRP6.** Demonstrate creativity and innovation.
- **CRP7.** Employ valid and reliable research strategies.
- **CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP10**. Plan education and career paths aligned to personal goals.
- **CRP11**. Use technology to enhance productivity.
- **CRP12**. Work productively in teams while using cultural global competence.
- **9.3.ST.1** Apply engineering skills in a project that requires project management, process control and quality assurance.
- **9.3.ST.2** Use technology to acquire, manipulate, analyze and report data.
- **9.3.ST.3** Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
- **9.3.ST.4** Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
- **9.3.ST.5** Demonstrate an understanding of the breadth of career opportunities and means to those opportunities in each of the Science, Technology, Engineering & Mathematics Career Pathways.
- **9.3.ST.6** Demonstrate technical skills needed in a chosen STEM field.
- **9.3.ST-SM.1** Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.
- **9.3.ST-SM.2** Apply science and mathematics concepts to the development of plans, processes

and projects that address real world problems.

- **9.3.ST-SM.3** Analyze the impact that science and mathematics has on society.
- **9.3.ST-SM.4** Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

Learning Targets

CPI #	Cumulative Progress Indicators (CPI) for Unit
HS-PS-1	Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons.
HS-PS1-2	The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.

Unit Enduring Questions:

- In what ways can matter be categorized, and using what kind of properties?
- What distinguishes the difference between chemical and physical properties and changes?
- What properties are used to arrange the elements in the periodic table?

Unit Enduring Understandings:

- Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons.
- The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.
- Measurements in science result from a number and unit
- Measurements involved a level of precision and accuracy.
- All substances have characteristic properties that enable chemists to tell the substances apart.

Unit Objectives:
Students will know….

- Elements and their arrangement in the periodic table
- The major categories of matter
- Proper safety in a laboratory setting.

Unit Objectives:
Students will be able to…...

- List examples of branches of Chemistry**.**
- Compare and Contrast Basic Research, Applied Research, and technological development
- Classify matter based upon properties

• The major types of equipment used in a lab. • Common calculations based upon measurement, such as density and volume. • Use of SI and metric measurements.	● Distinguish between physical and chemical properties Law of conservation of energy ● Distinguish between mixtures and pure substance ● Use periodic table to name elements and symbols ● Describe arrangement of periodic table ● List characteristics of metals, nonmetals, and metalloids. ● Safely conduct laboratory investigations. ● Perform calculations based upon measurements.

Lower Cape May Regional School District Chemistry Curriculum
Unit 2 Overview

Content Area: Science

Unit Title: The Atom

Target Course/Grade Level: Chemistry/10-12

Unit Summary:

- The Atom
- Law of conservation of mass
    - Law of definite proportions
    - Law of multiple proportions
- Experiments leading to atomic theory
    - Dalton – the atom
    - Thomson - electrons
    - Rutherford and the Nucleus
    - Nucleus - nuclear change
    - Atomic mass and average atomic mass

- Nuclear notation
- isotopes

Interdisciplinary Connections:
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Learning Targets	
CPI #	**Cumulative Progress Indicators (CPI) for Unit**
HS-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Unit Enduring Questions: ● How can an understanding of subatomic particles lead scientists to better explain the atom and its interactions? ● How can scientists gather data for things that are not visible to the naked eye?	**Unit Enduring Understandings:** ● Matter is made up of atoms, which contain smaller units defined by their charge ● Scientists can conduct experiments to gather information, even about things that cannot be seen.
Unit Objectives: ***Students will know….*** ● Atoms consist of protons, neutrons and electrons and make up all matter**.** ● The structure of an atom including mass, location and charges of subatomic particles. ● Atomic mass is a weighted average of all of the isotopes and their relative abundance.	**Unit Objectives:** ***Students will be able to…...*** ● Determine atomic mass, mass number and amount of each subatomic particle of an element. ● Map positions of various subatomic particles within an atom. ● Change the proportions of subatomic particles within an atom to achieve specific elements, ions or isotopes. ● Categorize atoms and/or groups of atoms as elements or compounds. ● Calculate weighted average given mass number and relative abundance.

Lower Cape May Regional School District Chemistry Curriculum
Unit 3 Overview

Content Area: Science

Unit Title: Arrangement of Electrons in Atoms

Target Course/Grade Level: Chemistry/10-12

Unit Summary:

- The Development of a New Atomic Model
  - Explain the mathematical relationship among the speed, wavelength, and frequency of electromagnetic radiation
  - Describe the Bohr Model of the hydrogen atom ○ Quantum Model of the Atom
  - Discuss de Broglie's role in the development of the quantum model of the atom
  - Compare and contrast the Bohr Model and the quantum model of the atom
  - Explain how the Heisenberg uncertainty principle and the Schrodinger wave equation led to the idea of atomic orbitals
  - List the four quantum numbers and describe their significance
  - Relate the number of sublevels corresponding to each of an atom's main energy levels, the number of orbitals per sublevel, and the number of orbitals per main energy level ○
  - Electron Configuration
    - List the total number of electrons needed to fully occupy each main energy level
    - State the Aufbau principle, the Pauli exclusion principle, and Hund's rule
    - Describe the electron configurations for the atoms of any element using orbital notation, electron-configuration notation, and noble gas notation.
  - Photo electron spectroscopy data analysis

Interdisciplinary Connections:

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Learning Targets

CPI #	Cumulative Progress Indicators (CPI) for Unit
HS-PS1-1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Unit Enduring Questions:	Unit Enduring Understandings:
● Particles within an atom allow for unique	● Why is it helpful to scientists to be able to

properties that can help scientists to distinguish one element from another. ● The "Planetary" model is outdated and does not accurately reflect what is currently known about the atom.	understand the way that specific atoms behave? ● How has the atomic model changed over the course of history and why was it necessary?
Unit Objectives: ***Students will know….*** ● Electrons exist in quantized energy levels and can jump up or down to the next level depending on energy lost or gained. ● The amount of energy lost or gained from an electron changing levels is specific to an element and creates a unique emission spectrum. ● Emission spectra can be used to identify elements present within a compound. ● The amount of energy contained within a photon of light is inversely proportional to its wavelength. ● Electrons can exist alone or in pairs with opposite spin inside orbitals. ● There are different types of orbitals that electron fill in a set order. ● Atoms tend to prefer configurations that leave orbitals full or half full.	**Unit Objectives:** ***Students will be able to…...*** ● Explain What happens on a subatomic level when energy is absorbed or released by an atom. ● Calculate amount of energy gained or released from an atom by observing its emission spectrum. ● Write an explanation accounting for some elements emitting many different bands of light while others only release a few. ● Design an experiment to determine which type of gas is present in the tubes of a "neon" sign. ● Infer which bands form from energy released by inner orbitals and which form from energy released by outer orbitals. ● Draw an orbital diagram for a given element using up and down arrows to represent spin. ● Develop a model using the periodic table to assist in determining the order in which various orbitals are filled. ● Write an electron configuration for a given element. ● Predict how the electron configuration for an atom might change if it were to ionize. ● Investigate an exception to the rules for orbital filling and explain said phenomenon.
Lower Cape May Regional School District Chemistry Curriculum **Unit 4 Overview**	
Content Area: Science	

Unit Title: Periodic Law

Target Course/Grade Level: Chemistry/10-12

Unit Summary:

- History of the Periodic Table
    - Explain the roles of Mendeleev and Moseley in the development of the periodic table
    - Describe the modern periodic table
    - Explain how the periodic law can be used to predict the physical and chemical properties of the elements
    - Describe how the elements belonging to a group of the periodic table are interrelated in terms of atomic number
        - Electron Configuration and the Periodic Table
    - Describe the relationship between electrons in sublevels and the length of each period on the periodic table
    - Locate and name the four blocks of the periodic table
    - Discuss the relationship between the group configuration and group numbers
        - Describe the locations in the periodic table and the general properties of the alkali metals, alkaline-earth metals, halogens, and noble gases. Electron Configuration and Periodic Properties
    - Define atomic and ionic radii, ionization energy, electron affinity, and electronegativity
    - Compare the periodic trends, define valence electrons, and state how many are present in atoms of each main-group element
    - Compare the d-block elements with the main-group elements

Interdisciplinary Connections:

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Learning Targets

CPI #	Cumulative Progress Indicators (CPI) for Unit
HS-PS1-1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit Enduring Questions: ● **Scientists can use the distinct properties of elements or compounds to solve real world problems.** ● **Many trends can be observed across the periodic table due to differences atomic structure.**	**Unit Enduring Understandings:** ● **How can the periodic table help us to develop new useful materials and technologies?** ● **How do differences in atomic structure result in an element's distinct properties?**
Unit Objectives: ***Students will know….*** ● Atomic Structure determines the arrangement of elements in the periodic table. ● The arrangement of the electrons of an atom determine the chemical behavior of an atom as well as its physical properties. ● Trends in atomic radius, ionic radius, electronegativity, ionization energy and reactivity can be observed across the periodic table. ● Trends are mostly due to the distance of valence shells from the nuclei, the size of the nucleus and how full a valence shell is. ● Scientists have used, and continue to use, the periodic table to determine which materials might be useful in helping to solve real world problems.	**Unit Objectives:** ***Students will be able to…...*** ● Describe how the elements are organized in the periodic table. ● Predict where new, undiscovered elements would fit into the periodic table. ● Anticipate the likelihood of two elements reacting with one another based on their chemical properties. ● Predict the properties of an element based on its position on the periodic table ● Compare two or more elements using any of the periodic trends. ● Modify an element of known characteristics and explain how the change would affect those characteristics. ● Organize a list of un-named elements based on properties, atomic structure and periodic trends. ● Anticipate ways that the periodic table can be used in the future to determine which materials could be used to solve problems.

Lower Cape May Regional School District Chemistry Curriculum **Unit 5 Overview**
Content Area: Science

Unit Title: Chemical Bonding, Chemical Formula and Chemical Compounds

Target Course/Grade Level: Chemistry/10-12

Unit Summary:

Chemical bonding

- Ionic
- Covalent
- Metallic
- Explain why most chemical bonding is neither purely ionic nor covalent
- Classify bonding type according to electronegativity differences

Ionic Bonding and Ionic Compounds

- Compare and contrast a chemical formula for a molecular compound with one for an ionic compound
- Formation of an ionic compound - coulombs law and attractive forces
- Balancing charges in a bond
- Monatomic ions and periodic arrangement
- Polyatomic ions - focus on most common
- Discuss the arrangements of ions in crystals, define lattice energy and explain its significance
- List and compare the distinctive properties of ionic compounds

Covalent Bonding and Molecular Compounds

- Define molecule and molecular formula
- Explain the relationships among potential energy and atomic distance
- bond length, and bond energy
- State the octet rule
- Describe the steps in determine the Lewis structure in neutral molecules and polyatomic ions
- Explain how to determine Lewis structures for molecules containing single bonds,
- multiple bonds, or both
- Explain why scientists use resonance structures to represent some molecules

Molecular Geometry

- Explain VSEPR theory
- Predict the shapes of molecules or polyatomic ions using VSEPR theory
- Explain how the shapes of molecules are accounted for by hybridization theory
- Describe dipole-dipole forces, hydrogen bonding, induced dipoles, and London
- dispersion forces and their effects on properties such as boiling points and melting points

- Explain what determines molecular polarity

Intermolecular Forces

- Polar bonds
- Dipole bond types
- Hydrogen bonds
- Van Der Waals forces

Interdisciplinary Connections:

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Learning Targets

CPI #	Cumulative Progress Indicators (CPI) for Unit
HS-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Unit Enduring Questions:

- Forces affect interactions between atoms just as they effect interactions between larger objects.
- The shape that a particular molecule takes is very consistent, which is important to a variety of important chemical reactions.
- The nature of the bond(s) within a material will help determine its properties, which scientists can use to develop useful materials.

Unit Enduring Understandings:

- How can a basic understanding of physics be used to predict shapes of particular molecules?
- How might the world be affected if different molecular shapes formed each time the same elements combined in a particular order?
- How can knowledge of bonding help to develop new useful materials and technologies?

Unit Objectives: ***Students will know….***	**Unit Objectives:** ***Students will be able to…...***
● There is a set of rules for naming ionic and covalent compounds. ● Polar compounds result from unequal sharing of electrons; therefore, due to the large difference in charge, ionic compounds are always polar and stronger, on average, than covalent bonds. ● The polarity of a particular bond depends on the difference in electronegativity between the two atoms involved, while overall molecule polarity is determined by shape and symmetry. ● Bond strength plays in important role in determining a compound's properties. ● Metals have very loosely attached valence electrons resulting in a sea of delocalized electrons, which account for many of the metallic properties. ● The VSEPR model accounts for repulsion forces of electron orbitals to determine the shape of a molecule.	● Identify a given compound based on its composition. ● Evaluate the current system in place for naming ionic and molecular compounds. ● Describe bonding interactions at the subatomic level. ● Modify a compound in order to make more or less polar. ● Calculate electronegativity difference for elements in a given compound and determine individual bond polarity. ● Compare polarity of one molecule to another. ● Create a model of a molecule and explain why it is polar or nonpolar based on the periodic trends. ● List the properties that could be affected by bond strength. ● Explain why a particular property is affected by the strength of the bonds. ● Construct a molecule that will have specific, predetermined properties. ● Describe the subatomic characteristics that cause molecules to behave the way they do in a chemical bond. ● Relate subatomic characteristics within metals to real world examples of metallic properties and interactions. ● Sketch the Lewis structure for a given molecule and describe its shape. ● Change the drawing for a molecule to reflect a different amount of lone pairs and/or attached atoms. ● Write an explanation for why changing the number of lone pairs and/or attached atoms would affect the structure of a compound.

Lower Cape May Regional School District Chemistry Curriculum
Unit 6 Overview

Content Area: Science

Unit Title: Chemical Formula and The Mole

Target Course/Grade Level: Chemistry/10-12

Unit Summary:

Chemical Names and Formulas

- Explain the significance of a chemical formula
- Determine the formula of an ionic compound formed between two given ions
- Name an ionic compound given its formula
- Using prefixes, name a binary molecular compound from its formula, and write the
- formula of a binary molecular compound given its name

Oxidation Numbers

- List the rules for assigning oxidation numbers
- Give the oxidation number for each element in the formula of a chemical compound
- Name binary molecular compounds using oxidation numbers and the Stock system.

The Mole

- Calculate the formula mass or molar mass of any given compound
- Use molar mass to convert between mass in grams and amount in moles of a chemical compound
- Calculate the number of molecules, formula units, or ions in a given molar amount of a chemical compound
- Calculate the percentage composition of a given chemical compound.

Determining Chemical Formulas

- Define empirical formula of a compound and the hydrate of a compound
- Explain how the term applies to ionic and molecular compounds

Molarity

- Determine the molarity of a solution

- Determine how to perform the dilution of a solution

Interdisciplinary Connections:

- Literacy and Math
- **RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- **SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

21st Century Themes, Skills, and Standards:

- **CRP2**. Apply appropriate academic and technical skills.
- **CRP4.** Communicate clearly and effectively and with reason.
- **CRP6.** Demonstrate creativity and innovation.
- **CRP7.** Employ valid and reliable research strategies.
- **CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP10**. Plan education and career paths aligned to personal goals.
- **CRP11**. Use technology to enhance productivity.
- **CRP12**. Work productively in teams while using cultural global competence.
- **9.3.ST.1** Apply engineering skills in a project that requires project management, process control and quality assurance.
- **9.3.ST.2** Use technology to acquire, manipulate, analyze and report data.
- **9.3.ST.3** Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
- **9.3.ST.4** Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
- **9.3.ST.5** Demonstrate an understanding of the breadth of career opportunities and means to those opportunities in each of the Science, Technology, Engineering & Mathematics Career Pathways.
- **9.3.ST.6** Demonstrate technical skills needed in a chosen STEM field.
- **9.3.ST-SM.1** Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.
- **9.3.ST-SM.2** Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
- **9.3.ST-SM.3** Analyze the impact that science and mathematics has on society.
- **9.3.ST-SM.4** Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

Learning Targets	
CPI #	**Cumulative Progress Indicators (CPI) for Unit**
HS-PS1-1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Unit Enduring Questions: ● What are the different ways to name chemical compounds? ● How are oxidation numbers like ionic charges? ● How is the mole used for counting atoms related to the mass of matter? ● How is the molar mass of elements used to determine the chemical formula	**Unit Enduring Understandings:** • Different groups of compounds follow guidelines for naming • Oxidation numbers reveal the state of electron exchange of an atom in a compound. • The mole is a method of counting particles. • Molar mass is the mass of one mole of matter. • The mole can be used to determine the formula of a substance. • Molarity is a measure of the amount of particles dissolved in water.
Unit Objectives: ***Students will know….*** ● The set of rules for naming ionic and covalent compounds. ● The guidelines for determining oxidation numbers and states for elements in a compound. ● Converting using molar quantities. ● Determining the formula of a compound based upon mole and mass values. ● Determine the concentration of a	**Unit Objectives:** ***Students will be able to…...*** ● Evaluate the current system in place for naming ionic and molecular compounds. ● Identify the oxidation number of an element. ● Convert between mole amounts and measured quantities of mass and volume. ● Determine the empirical and molecular formula of a compound. ● Dilute a sample of a known concentration.

solution and how to dilute a sample of a known concentration.	

Lower Cape May Regional School District Chemistry Curriculum
Unit 7 Overview

Content Area: Science

Unit Title: Chemical Equations and Reactions

Target Course/Grade Level: Chemistry/10-12

Unit Summary:

- Chemical reactions
  - Definition of a chemical reaction
  - Evidence of a chemical reaction
  - Representing a chemical reaction
- Writing a chemical equation
  - Word equation
  - Formula equation
  - Chemical equation
  - Symbols used in chemical equations
  - Balancing chemical equations

- Types of chemical reactions
  - Synthesis
  - Decomposition
  - Single Replacement
    - Activity series – prediction of reaction
  - Double Replacement
    - Solubility Rules and reaction predictions

- Stoichiometry
  - Applications of stoichiometry to real world use
  - Types of stoichiometry conversions involving mass and mole
  - Limiting Reactants
  - Percent Yield
  - Solutions stoichiometry

- Thermochemistry
    - Exothermic vs Endothermic
    - Specific Heat of a reaction
- Rate Kinetics
    - Factors that influence rate of reactions
- Chemical equilibrium
    - Reversible Reaction
    - Equilibrium constant and the reaction quotient

Interdisciplinary Connections:

- Literacy and Math
- **RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- **SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

21st Century Themes, Skills, and Standards:

- **CRP2**. Apply appropriate academic and technical skills.
- **CRP4.** Communicate clearly and effectively and with reason.
- **CRP6.** Demonstrate creativity and innovation.
- **CRP7.** Employ valid and reliable research strategies.
- **CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP10**. Plan education and career paths aligned to personal goals.
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- **CRP12**. Work productively in teams while using cultural global competence.
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- **9.3.ST.2** Use technology to acquire, manipulate, analyze and report data.
- **9.3.ST.3** Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
- **9.3.ST.4** Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
- **9.3.ST.5** Demonstrate an understanding of the breadth of career opportunities and means to those opportunities in each of the Science, Technology, Engineering & Mathematics Career Pathways.
- **9.3.ST.6** Demonstrate technical skills needed in a chosen STEM field.
- **9.3.ST-SM.1** Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.

- **9.3.ST-SM.2** Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
- **9.3.ST-SM.3** Analyze the impact that science and mathematics has on society.
- **9.3.ST-SM.4** Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

Learning Targets

CPI #	Cumulative Progress Indicators (CPI) for Unit
HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
HS-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-PS3-5	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

Unit Enduring Questions:

- To what degree should the average non-scientist understand the concept of chemical reactions? How might this understanding be useful in everyday life?
- How can qualitative data obtained from chemical reactions be used to gather useful information?

Unit Enduring Understandings:

- We all observe and rely on a variety of chemical reactions to take place every day.
- Chemical reactions can be described both qualitatively and quantitatively.
- Certain recurring patterns can be observed in chemical reactions, which can help to predict.

● How might the way that a molecule distributes its electrons affect its various properties? ● How can energy be used to determine if a reaction happens? ● What factors will reveal if a reaction will move forward or reverse?	● Energy transfer is involved in chemical reactions. ● There are factors that influence the rate of a chemical reaction. ● Rate of chemical reactions is change in concentration over change in time. ● Chemical reactions are reversible under the correct conditions.
Unit Objectives: ***Students will know….*** ● There are different types of chemical reactions (such as: synthesis, decomposition, combustion, single replacement and double replacement.) ● The Law of Conservation of Mass states that matter cannot be created or destroyed, therefore, matter is always conserved. ● The release or absorption of energy depends on the total changes in bond energy. ● Reaction products can be predicted based on valence electron states, periodic trends and chemical properties. ● Reaction rates are measured by change in concentration over change in time. ● Many factors influence the rate of a chemical reaction. ● What factors influence equilibrium in a chemical reaction.	**Unit Objectives:** ***Students will be able to…...*** ● Insert unit objectives here in the form of student will be able to. ● Categorize chemical reactions as one of the known types. ● Balance a chemical equation. ● Develop an argument for a claim that less mass of product was produced in a test tube than the total mass of the reactant, pointing out possible experimental flaws and designing an experiment to test the claim. ● Calculate the net change in total bond energy for a particular reaction. ● Predict whether a reaction will occur based on periodic trends. ● Predict the products for a particular reaction. ● Determine the rate of a reaction. ● Determine if a reaction is exothermic or endothermic. ● Will a reaction move forward or reverse.

Lower Cape May Regional School District Chemistry Curriculum **Unit 8 Overview**
Content Area: Science

Unit Title: States of Matter and Solutions

Target Course/Grade Level: Chemistry/10-12

Unit Summary:

- Kinetic-Molecular Theory of Matter
- State and describe how it explains certain properties of matter
- List five assumptions of the KMT of gases
    - Define real and ideal gases
    - Describe each of the following characteristic properties of gases:
        - Expansion, density, fluidity, compressibility, diffusion, and effusion
        - Describe the conditions under which a real gas deviates from "ideal" behavior
- KMT for Solids and Liquids
    - Describe the motion of particles, and the properties associated Discuss the phase change processes
    - Define vaporization and freezing
    - Define crystal structure and unit cell
- Changes of state
    - Explain the relationship between equilibrium and changes of state Interpret phase change diagrams
    - Explain what is meant by equilibrium vapor pressure
    - Describe process of boiling, freezing, melting, and sublimation
- Water
    - Describe the structure of a water molecule
    - Discuss the physical properties of water
    - Explain how the properties are determined by the structure of water
    - Calculate amount of energy absorbed or released when a quantity of water changes state
- Colligative properties of solutions
    - Boiling point elevation
    - Freezing point depression
    - Osmotic Pressure - connection to biology

Interdisciplinary Connections:

- Literacy and Math
- **RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- **SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and

evidence and to add interest.

21st Century Themes, Skills, and Standards:

- **CRP2**. Apply appropriate academic and technical skills.
- **CRP4.** Communicate clearly and effectively and with reason.
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Learning Targets

CPI #	Cumulative Progress Indicators (CPI) for Unit
HS-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

Unit Enduring Questions: ● How do different states of matter behave? ● What are the relative energies for different states of matter? ● What does vapor pressure tell us about how a liquid behaves? ● How do gasses behave, when pressure, temperature, and volume are altered? ● What are the different intermolecular forces and how do we determine which ones are present and their relative strengths when compared to one another? ● How can one determine the new boiling point or freezing point of a solution?	**Unit Enduring Understandings:** ● States of matter are determined by energy of the molecule. ● Everything in nature goes towards the most stable energy state. ● Behavior and properties of matter are defined by the structure of the molecule and the material's current state of matter. ● There are different forces between molecules depending on the makeup and size of a molecule. ● Freezing and boiling points of a substance can be changed by adjusting the solution.
Unit Objectives: ***Students will know….*** ● Solids, liquids, and gasses all behave differently, gasses are the most fluid, followed by liquids, and solids are the most rigid. ● London dispersion forces are present in all molecules, dipole-dipole interactions occur with all polar molecules, and hydrogen bonding occurs with only specific types of polar molecules. ● The stronger the intermolecular force, the high the boiling point of a material. The relative strength of intermolecular forces is hydrogen bonding at the	**Unit Objectives:** ***Students will be able to…...*** ● Create a general model describing molecules of a gas, liquid, or solid interacting. ● Determine the type of intermolecular forces a molecule experiences based off of its structure. ● Organize relative boiling points of different molecules based off of the molecular properties. ● Analyze and apply a phase change diagram to a real world material. ● Calculate different properties of gasses using the ideal gas law and the ideal gas law derivatives. ● Determine changes in freezing point and

strongest, dipole dipole interactions in the middle, and London dispersion forces generally being the weakest. ● Phase change diagrams show the conditions in which materials change phases from solid to liquid to gas. ● The ideal Gas law and the Ideal Gas law derivatives (Boyle's, Charles', and Combined) are sets of equations that can be used to determine the volume, pressure, temperature, and number of moles of gas are present in a system. ● The freezing point and boiling point of solutions can be changed.	boiling point of solutions.

Lower Cape May Regional School District Chemistry Curriculum
Unit 9 Overview

Content Area: Science

Unit Title: Acids and Bases

Target Course/Grade Level: Chemistry/10-12

Unit Summary:

- Properties of Acids and Bases
  - List five general properties of aqueous acids and bases
  - Name common binary acids and oxyacids, given their chemical formulas
  - List five acids commonly used in industry and laboratory, and give two properties of each
  - Define acid and base according to Arrhenius's theory of ionization
  - Explain the difference between strong and week bases
- Acid-Base Theories
  - Define and recognize Bronsted-Lowry acids and bases
  - Define a Lewis acid and a Lewis base
  - Name compounds that are acids under the Lewis definition by not under the Bronsted- Lowry definition
- Acid-Base Reactions
  - Describe a conjugate acid, conjugate base, and an amphoteric compound

- Explain the process of neutralization
- Define acid rain, and describe its effects
- Demonstrate the use of titration to determine properties of an acid or base
- Apply the use of the proper indicator for an acid base reaction/titration

Interdisciplinary Connections:

Literacy and Math

- **RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- **SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

21st Century Themes, Skills, and Standards:

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- **9.3.ST.1** Apply engineering skills in a project that requires project management, process control and quality assurance.
- **9.3.ST.2** Use technology to acquire, manipulate, analyze and report data.
- **9.3.ST.3** Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
- **9.3.ST.4** Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
- **9.3.ST.5** Demonstrate an understanding of the breadth of career opportunities and means to those opportunities in each of the Science, Technology, Engineering & Mathematics Career Pathways.
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- **9.3.ST-SM.3** Analyze the impact that science and mathematics has on society.
- **9.3.ST-SM.4** Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

Learning Targets	
CPI #	**Cumulative Progress Indicators (CPI) for Unit**
HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-PS1-6	Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium
HS-PS1-7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

Unit Enduring Questions:	**Unit Enduring Understandings:**
• How are acid/base solutions different from other types of solutions? • What determines whether a solution is an acid or a base? • How is the pH of a solution determined?	• Acids and bases have distinct properties • Water and salts are produced from the reactions of acids and bases • pH is a measure of the acidity of a solution
Unit Objectives: ***Students will know….***	**Unit Objectives:** ***Students will be able to…...***
• To distinguish between an acid and a base • an acid or a base interacts with water in a solution • the pH scale is determined • titration is used to determine concentration and pH of an unknown acid or base	• Describe how the various acid and base theories have progressed through the centuries. • Understand the pH scale. • Differentiate between acids and bases. Identify properties of acids and bases. • Identify household as acidic or basic based on their properties.

Lower Cape May Regional School District Chemistry Curriculum
Unit 10 Overview

Content Area: Science

Unit Title: Nuclear

Target Course/Grade Level: Chemistry/10-12

Unit Summary:
Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

Interdisciplinary Connections:

- **Literacy and Math**
- **RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- **SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

21st Century Themes, Skills, and Standards:

- **CRP2**. Apply appropriate academic and technical skills.
- **CRP4.** Communicate clearly and effectively and with reason.
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- **CRP7.** Employ valid and reliable research strategies.
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- **9.3.ST.1** Apply engineering skills in a project that requires project management, process control and quality assurance.
- **9.3.ST.2** Use technology to acquire, manipulate, analyze and report data.
- **9.3.ST.3** Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
- **9.3.ST.4** Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
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- **9.3.ST.6** Demonstrate technical skills needed in a chosen STEM field.
- **9.3.ST-SM.1** Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.
- **9.3.ST-SM.2** Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
- **9.3.ST-SM.3** Analyze the impact that science and mathematics has on society.
- **9.3.ST-SM.4** Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

Learning Targets

CPI #	Cumulative Progress Indicators (CPI) for Unit
HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay
HS-ETS1-3	Evaluate a solution to a complex real- world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit Enduring Questions:

- Decay of atoms can be used to create large amounts of energy that could power our homes.

Unit Enduring Understandings:

- How can understanding fission and fusion help with sustaining energy needs and sustainability?

Unit Objectives: ***Students will know….*** ● Elements can spontaneously decay to form other elements, radiation and large amounts of energy as well as new elements. ● Each isotope of an element decays at its own, relatively consistent rate.	**Unit Objectives:** ***Students will be able to…...*** ● Solve an equation for the missing radioactive Decay particle or the element formed or changed in a nuclear reaction. ● Compare amounts of initial substance to amount remaining after radioactive decay. ● Predict how much of a substance should be present after a certain amount of time and/or number of half-lives. ● List products and reactants of nuclear reactions used to make. ● Argue the effectiveness of nuclear energy as a sustainable resource.

Lower Cape May Regional School District Chemistry Curriculum Evidence of Learning
Specific Formative Assessments Utilized in Daily Lessons: ● Google forms questions ● Anticipatory set with questions ● Exit passes ● Pre-lab questions ● Post lab questions ● Kahoot
Summative Assessment Utilized throughout Units: ● Unit assessments ● Pre-assessment ● Quarterly Exam ● Lab Report ● Weekly quizzes ● POGIL

Modifications for ELL's, Special Education, 504, and Gifted and Talented Students:

- Teacher tutoring
- Peer tutoring
- Cooperative Learning Groups
- Modified Assignments
- Differentiated Instruction
- Response to Intervention (www.help4teachers.com)
- Follow all IEP and 504 modifications

Teacher Notes:

- As required by the NJ Department of Education, teachers in all content areas will integrate the 21st Century Life and Careers Standards. As the NJDOE indicates, "Providing New Jersey students with the life and career skills needed to function optimally within this dynamic context is a critical focus and organizing principle of K-12 public education. New Jersey has both an obligation to prepare its young people to thrive in this environment, and a vested economic interest in grooming an engaged citizenry made up of productive members of a global workforce that rewards innovation, creativity, and adaptation to change." The links below indicate the CPIs for grade ranges and need to be addressed throughout the units of study:
  Life and Career Standards
- As indicated in the NJSLS, standards and interdisciplinary connections will be integrated throughout content area curriculum. Links to relevant content standards can be found below:

https://www.nj.gov/education/cccs/2014/career/93.pdf

Project-based Learning Tasks:

- Elementally me
- Elemental Mole
- Atomic Theory timeline
- African American History Month Science Resume
- Engineering and science – design a prototype of a water filter
- Recycling plant design project
- Periodic Trends Guidebook
- Compounds that Influenced Culture and Society

Vocabulary:

- In-text vocabulary should be incorporated into every unit. Word journals, vocabulary walls, and/or various other activities should be utilized by the instructor to teach vocabulary.

The Research Process:
The research process must be integrated within each course curriculum. Student will be provided with opportunities to investigate issues from thematic units of study. As the NJSLS indicate, students will develop proficiency with MLA or APA format as applicable.

- Research will entail the process of the lab activity leading to students developing their own investigation, inquiry labs
- Students investigate and report on different themes in chemistry such as periodic trends, atomic theory, nuclear energy and current events as well as career options in science.

Technology:
Students must engage in technology applications integrated throughout the curriculum.
Applicable technology utilized in this curricula are included below:

- Chromebook
- Google Classroom
- pHet simulations
- Ted-ed
- Vernier Probeware and graphical analysis software

Resources:
Ancillary resources and materials used to deliver instruction are included below:

- ACS – AACT
- New Jersey Center for teaching and learning
- NJSTA
- Ted-Ed
- Google forms
- Google classroom
- Remind
- PowerPoint

Differentiation Strategies

Differentiation strategies can require varied amounts of preparation time. High-prep strategies often require a teacher to both create multiple pathways to process information/demonstrate learning and to assign students to those pathways. Hence, more ongoing monitoring and assessment is often required. In contrast, low-prep strategies might require a teacher to strategically create process and product choices for students, but students are allowed to choose which option to pursue given their learning profile or readiness level. Also, a low-prep strategy might be focused on a discrete skill (such as vocabulary words), so there are fewer details to consider. Most teachers find that integration of one to two new low-prep strategies and one high-prep strategy each quarter is a reasonable goal.

Low Prep Strategies (add to list as needed)	
Varied journal prompts, spelling or vocabulary lists	Students are given a choice of different journal prompts, spelling lists or vocabulary lists depending on level of proficiency/assessment results.
Anchor activities	Anchor activities provide meaningful options for students when they are not actively engaged in classroom activities (e.g., when they finish early, are waiting for further directions, are stumped, first enter class, or when the teacher is working with other students). Anchors should be directly related to the current learning goals.
Choices of books	Different textbooks or novels (often at different levels) that students are allowed to choose from for content study or for literature circles.
Choices of review activities	Different review or extension activities are made available to students during a specific section of the class (such as at the beginning or end of the period).
Homework options	Students are provided with choices about the assignments they complete as homework. Or, students are directed to specific homework based on student needs.
Student-teacher goal setting	The teacher and student work together to develop individual learning goals for the student.
Flexible grouping	Students might be instructed as a whole group, in small groups of various permutations (homogeneous or heterogeneous by skill or interest), in pairs or individual. Any small groups or pairs change over time based on assessment data.
Varied computer programs	The computer is used as an additional center in the classroom, and students are directed to specific websites or software that allows them to work on skills at their level.
Multiple Intelligence or Learning Style options	Students select activities or are assigned an activity that is designed for learning a specific area of content through their strong intelligence (verbal-linguistic, interpersonal, musical, etc.)
Varying scaffolding of same organizer	Provide graphic organizers that require students to complete various amounts of information. Some will be more filled out (by the teacher) than others.

Think-Pair-Share by readiness, interest, and/or learning profile	Students are placed in predetermined pairs, asked to think about a question for a specific amount of time, then are asked to share their answers first with their partner and then with the whole group.
Mini workshops to re-teach or extend skills	A short, specific lesson with a student or group of students that focuses on one area of interest or reinforcement of a specific skill.
Orbitals	Students conduct independent investigations generally lasting 3-6 weeks. The investigations "orbit" or revolve around some facet of the curriculum.
Games to practice mastery of information and skill	Use games as a way to review and reinforce concepts. Include questions and tasks that are on a variety of cognitive levels.
Multiple levels of questions	Teachers vary the sorts of questions posed to different students based on their ability to handle them. Varying questions is an excellent way to build the confidence (and motivation) of students who are reluctant to contribute to class discourse. Note: Most teachers would probably admit that without even thinking about it they tend to address particular types of questions to particular students. In some cases, such tendencies may need to be corrected. (For example, a teacher may be unknowingly addressing all of the more challenging questions to one student, thereby inhibiting other students' learning and fostering class resentment of that student.)
High Prep Strategies (add to list as needed)	
Cubing	Designed to help students think about a topic or idea from many different angles or perspectives. The tasks are placed on the six sides of a cube and use commands that help support thinking (justify, describe, evaluate, connect, etc.). The students complete the task on the side that ends face up, either independently or in homogenous groups.
Tiered assignment/ product	The content and objective are the same, but the process and/or the products that students must create to demonstrate mastery are varied according to the students' readiness level.
Independent studies	Students choose a topic of interest that they are curious about and wants to discover new information on. Research is done from questions developed by the student and/or teacher. The researcher produces a product to share learning with classmates.

4MAT	Teachers plan instruction for each of four learning preferences over the course of several days on a given topic. Some lessons focus on mastery, some on understanding, some on personal involvement, and some on synthesis. Each learner has a chance to approach the topic through preferred modes and to strengthen weaker areas
Jigsaw	Students are grouped based on their reading proficiency and each group is given an appropriate text on a specific aspect of a topic (the economic, political and social impact of the Civil War, for example). Students later get into heterogeneous groups to share their findings with their peers, who have read about different areas of study from source texts on their own reading levels. The jigsaw technique allows you to tackle the same subject with all of your students while discreetly providing them the different tools they need to get there.
Multiple texts	The teacher obtains or creates a variety of texts at different reading levels to assign strategically to students.
Alternative assessments	After completing a learning experience via the same content or process, the student may have a choice of products to show what has been learned. This differentiation creates possibilities for students who excel in different modalities over others (verbal versus visual).
Modified Assessments	Assessments can be modified in a variety of ways – for example by formatting the document differently (e.g. more space between questions) or by using different types of questions (matching vs. open ended) or by asking only the truly essential questions.
Learning contracts or Personal Agendas	A contract is a negotiated agreement between teacher and student that may have a mix of requirements and choice based on skills and understandings considered important by the teacher. A personal agenda could be quite similar, as it would list the tasks the teacher wants each student to accomplish in a given day/lesson/unit. Both Learning contracts and personal agendas will likely vary between students within a classroom.
Compacting	This strategy begins with a student assessment to determine level of knowledge or skill already attained (i.e. pretest). Students who demonstrate proficiency before the unit even begins are given the opportunity to work at a higher level (either independently or in a group).
Literature circles	Flexible grouping of students who engage in different studies of a piece of literature. Groups can be heterogeneous and homogeneous.

Learning Centers	A station (or simply a collection of materials) that students might use independently to explore topics or practice skills. Centers allow individual or groups of students to work at their own pace. Students are constantly reassessed to determine which centers are appropriate for students at a particular time, and to plan activities at those centers to build the most pressing skills.
Tic-Tac-Toe Choice Board (sometimes called "Think-Tac-Toe"	The tic-tac-toe choice board is a strategy that enables students to choose multiple tasks to practice a skill, or demonstrate and extend understanding of a process or concept. From the board, students choose (or teacher assigns) three adjacent or diagonal. To design a tic-tac-toe board: - Identify the outcomes and instructional focus - Design 9 different tasks - Use assessment data to determine student levels - Arrange the tasks on a tic-tac-toe board either randomly, in rows according to level of difficulty, or you may want to select one critical task to place in the center of the board for all students to complete.
Curriculum development Resources/Instructional Materials:	
https://www.nextgenscience.org/new-jersey	
Board of Education Approved Text(s)	
• Modern Chemistry (2006) • Holt, Rinehart, Winston	