

# Township of Ocean Schools

Assistant Superintendent  
Office of Teaching and Learning

## **SPARTAN MISSION:**

*Meeting the needs of all students with a proud tradition of academic excellence.*

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### **Curriculum Development Timeline**

**School:** Ocean Township High School

**Course:** Chemistry

**Department:** Science

<b>Board Approval</b>	<b>Supervisor</b>	<b>Notes</b>
March 2009	Patrick Sullivan	Born Date
July 2010	Patrick Sullivan	Revisions
January 2012	Patrick Sullivan	Revisions
September 2015	Patrick Sullivan	Revisions
July 2016	Patrick Sullivan	Revisions
March 2019	Patrick Sullivan	Review

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Pacing Guide			
Week	Marking Period 1	Week	Marking Period 3
1	Lab Safety & Chemistry in Today's World	11	Molecular Geometry (VSEPR) & Intermolecular Forces
2	Matter & Change	12	Chemical Formulas & Chemical Compounds
3	Using Scientific Measurements in Chemistry	13	Chemical Formulas & Chemical Compounds
4	Using Scientific Measurements in Chemistry	14	The Math of Chemical Formulas The Mole
5	Atomic Structure	15	Chemical Equations & Reactions
Week	Marking Period 2	Week	Marking Period 4
6	Nuclear Chemistry	16	Stoichiometry The Math of Chemical Equations
7	Quantum Chemistry (Electromagnetic Spectrum & Light)	17	Thermochemistry & States of Matter
8	Electron Structure & The Periodic Table	18	Gas Laws
9	Electron Structure & The Periodic Table	19	Solutions, Acids and Bases, Chemical Equilibrium, & Reaction Rates
10	Chemical Bonding	20	Final Exam
Core Instructional & Supplemental Materials including various levels of Texts			
<b>Texts:</b>			

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Modern Chemistry---2009-Holt, Reinhart + Winston (Accelerated level)

Basic Chemistry-----2011-Timberlake + Timberlake, 3<sup>rd</sup> edition

### **Digital Resources Across All Levels: (D=differentiated)**

ChemTours digital program (D)

Edpuzzle (D)

Gizmo (D)

YouTube videos

New York Times Articles

PhET Interactive Simulations (D)

Science News (D)

Ted Talks

Time Frame

**1 Week**

### Topic

### **Lab Safety & Chemistry in Today's World**

### Essential Questions

- Why should students study chemistry and chemicals?
- What is the importance of laboratory safety?

### Enduring Understandings

- Students should study chemistry because it plays an integral part in all aspects of life.
- Having students learn the scientific method will help them to develop a theory using observations, hypotheses, and experiments.
- Students will demonstrate the basic safety rules that must be followed when working in the laboratory.

### **Alignment to Standards**

- **HS-ETS1-2**
- **HS-PS1-3**

### **Learning Activities & Key Concepts and Skills**

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- Understand the importance of studying the science of chemistry..
- List the basic safety rules that must be followed when working in the laboratory.
- Explain the reason for each laboratory safety rule.
- Describe the tools that will be used in the chemistry lab.
- Apply and understand the importance of all safety rules when performing lab work

## Assessments

### **Formative:**

- Think-Pair-Share
- Strategic Questioning
- Lesson Checks
- Writing a Lesson Summary
- Do Now
- Exit Tickets

### **Summative:**

- Laboratory Work
  - Gummy Worm Inquiry Activity
  - Safety First POGIL
- Quizzes – Lab Safety in the Chemistry Classroom

### **Benchmark:**

- Chemistry Department Skills Assessment Benchmark

### **Alternative:**

- Lab Safety Poster Project in lieu of Lab Safety Quiz

## Career Education

- CRP-2 – Students will work collaboratively to discover the difference between qualitative and quantitative data through inquiry (Gummy Worm Activity)
- CRP-4 – Students will represent understanding of safe lab practices by creating a lab safety poster which will be presented to the class.
- CRP-2- Students will demonstrate skills acquired in class through lab work

## 21st Century Skills

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9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

### Interdisciplinary Connections

- MA.9-12.N-Q.A.1 – Students will use units while taking quantitative measurements during the Gummy Worm Inquiry activity.
- LA.9-10.RST.9-10.3 – Students will follow steps will carrying out measuring tasks during the Gummy Inquiry.

### Technology Integration

- TECH.8.1.12.C.- Baruch Chemistry Lab Safety Interactive Tutorial
- TECH.8.1.12.C.-Youtube Video – Lab Safety Techniques –“Crash Course Chemistry”

Time Frame

**1 Week**

### Topic

### Matter & Change

### Essential Questions

- How can one explain the structure, properties, and interactions of matter?
- How can I classify matter based on how the particles are arranged?
- How can a periodic table help classify elements into metals, nonmetals, and metalloids?
- How do substances combine to form the variety of matter that makes up our world?
- How can the Law of Conservation of Matter be proven by conducting a chemical reaction?

### Enduring Understandings

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- Students should be able to name and describe the four states of matter.
- Students will be able to compare and contrast the difference between a pure substance and a mixture.
- Learning the difference between homogeneous and heterogeneous mixtures will allow students to describe several techniques to separate mixtures.
- Through studying matter, students will be able to compare their chemical and physical properties.
- Plan and conduct an investigation to gather evidence to compare the relative difference among elements on the periodic table
- Apply to the earth's layers and the geochemistry involved.

### Alignment to Standards

- |            |           |           |
|------------|-----------|-----------|
| • HS-PS1-1 | HS-ESS1-5 | HS-ESS2-3 |
| • HS-PS1-3 | HS-ESS1-6 | HS-ESS2-5 |
| • HS-PS1-7 | HS-ESS2-1 | HS-ESS3-2 |

### Learning Activities & Key Concepts and Skills

- Use the periodic table as a model to provide evidence for relative properties of elements at different scales based on patterns within a group and period.
- Use models (flow chart) to summarize and understand how matter can be found in nature
- Plan and conduct an investigation to prove the Law of Conservation of Matter
- Classify examples of matter as pure substances or mixtures.
- Identify the states and the physical and chemical properties of matter.
- Classify change as a physical process or a chemical process.

### Assessments

#### Formative:

- Think-Pair-Share
- Strategic Questioning
- Lesson Checks
- Do Now

#### Summative:

- Laboratory Work

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- Foaming Eggs Inquiry
- Observing a Chemical Reaction
- Law of Conservation of Mass Lab
- Separating Mixtures Inquiry
- Physical & Chemical Changes Lab with writing task
- Classification of Matter POGIL
- Quiz- Matter
- Test – Matter & Change

**Benchmark:**

**Alternative :**

### Career Education

- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab
- CRP-2- Students will demonstrate skills acquired in class through lab work

### 21st Century Skills

9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

### Interdisciplinary Connections

- LA.9-10RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures
- MA.9-12.N-Q.A.1- Students will use units to understand what is being measured and to correctly solve math problems.

### Technology Integration

- TECH.8.1.12.C.- Gizmo – States of Matter- Students will access software program to

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further investigate concepts	
Time Frame	2 Weeks
<b>Topic</b>	
<b>Using Scientific Measurements in Chemistry</b>	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>• What base units and prefixes are used in science for measuring length, mass, and volume?</li><li>• What are significant digits and how are they used in calculations?</li><li>• How are measurements converted into scientific notation?</li><li>• What are unit equalities and how are they used in solving dimensional analysis calculations?</li><li>• What information is needed to calculate both density and percent error? How are graphs used to distinguish between inversely and directly proportional relationships?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>• Students should be able to identify the metric units of measurements for mass, length, and volume.</li><li>• Students should be able to determine which digits in measurements are significant in chemistry calculations.</li><li>• Students will demonstrate how to convert measurements into and out of scientific notation.</li><li>• Having students learn how to obtain conversion equalities will allow students to use dimensional analysis to solve various quantitative problems in chemistry.</li><li>• Students will demonstrate their understanding of calculating of both density and percent error.</li><li>• Students will use their knowledge of construction a scientific graph to explain and display experimental data.</li></ul>	
<u>Alignment to Standards</u>	

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- **HS-PS1-3**
- HS-PS1-7

### Learning Activities & Key Concepts and Skills

- Use units as a way to understand problems and to guide the solution of multi-step problems; choose and use units consistently in formulas
- Reason abstractly and quantitatively
- Model with mathematics
- Develop and use models to help with understanding of key concepts.
- Planning and carrying out investigations using the metric system and significant figures
- Analyze and interpret data and graphs based on laboratory investigations.
- Constructing explanations and designing solutions for a specific scientific problem
- Select appropriate tools to collect, record, analyze, and evaluate data
- Plan and conduct an investigation
- Apply the concept of slope when calculating density
- Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated.
- Apply techniques of algebra and functions to represent and solve scientific engineering problems

### Assessments

#### **Formative:**

- Think-Pair-Share
- Do Now
- Strategic Questioning

#### **Summative:**

- Laboratory Work
  - Rainbow Volumes
  - Bunsen Burner Inquiry Lab
  - Graphing Scientific Data Activity
  - Density of a Penny Lab
  - Dimensional Analysis of Fudge Lab
- Quiz – The math of Chemistry
- Test – Measurements

#### **Benchmark:**

#### **Alternative :**

Career Education

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- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab
- CRP-2- Students will demonstrate skills acquired in class through lab work

### 21st Century Skills

9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

### Interdisciplinary Connections

- MA.9-12.A-CED.A4- Students will need to rearrange formulas to solve for various variables in a math problem throughout this unit.
- MA.9-13.A-RE1.D.10 – Students will use the graph they create in the Density of Penny lab to solve for the density using the slope.
- LA.9-10RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures

### Technology Integration

TECH.8.1.12.C.- Gizmo- Density Experiment –“Slice & Dice” – Students will access the Gizmo software program to further investigate lesson concepts.

Time Frame

**1 Week**

### Topic

Atomic Structure

### Essential Questions

- Why should students study the periodic table of elements?
- Who were the scientists and what was their contribution to the current model of the atom?
- What are the major components of an atom?
- How can you determine the number of protons, neutrons, and electrons in an atom or ion?
- What are Isotopes, and how are the differentiated?

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- How can you mathematically solve for the weighted average atomic mass of an isotope?

### Enduring Understandings

- Studying the periodic table is very useful for discovering, learning, and remembering the different properties of the elements.
- The contributions of the various scientists led to the current development of the atom.
- Students will demonstrate the understanding of the current atomic model by studying the past history of the atom.
- Learning the major components of the atom will lead students to the understanding of atomic number, mass number, ions, and isotopes.

### Alignment to Standards

- **HS-PS1-1**
- **HS-PS1-2**
- **HS-PS1-3**
- **HS-PS1-4**

### Learning Activities & Key Concepts and Skills

- Model with mathematics
- Reason abstractly and quantitatively
- Discuss contributions that scientists made to atomic structure
- Define the term atom, ions, and isotopes and discuss how they are different and related.
- Name and describe the three subatomic particles of an atom.
- Determine the number of protons, neutrons, and electrons in an atom or ion

- Assessments

#### **Formative:**

- Think-Pair-Share
- Do Now
- Strategic Questioning
- Lesson Check

#### **Summative:**

- Laboratory Work

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- History of The Atom – Atoms in Al Foil
- Bead Lab – Atoms, Ions, & Isotopes - Manipulative
- Halloweenium / Candium – Calculating Atomic Mass
- Quiz – History of Atomic Structure
- Quiz – Atomic Structure- Subatomic Particles, Ions, & Isotopes

### **Benchmark:**

### **Alternative:**

- Foldable Project in place of formal quiz on History of Atomic Structure Quiz - Rubric

### Career Education

- CRP-4- Students will demonstrate skills acquired in class through collaboration
- CRP-12 – Students work productively during group work.

### 21st Century Skills

9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

### Interdisciplinary Connections

- **LA.9-10.RST.9-10.5 – New and extensive vocabulary is introduced throughout this unit**
- LA.9-10.RST.9-10.3 – Students are required to read all lab procedures carefully while carrying out experiments.
- MA.9-12.N-Q.A.1- Students will use units when calculating atomic mass to guide them to a solution.

### Technology Integration

TECH.8.1.12.C.- & TECH.8.1.12.D.5- History of Atomic Structure Internet Assignment- Students will use the internet to research the scientists and their contribution to atomic structure to build a timeline to learn new content.

### Career Education

- CRP-2 – Students will work collaboratively during lab work

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- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab
- CRP-12- Students will demonstrate skills acquired in class through lab work

### 21st Century Skills

9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.  
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.

### Interdisciplinary Connections

Time Frame	1 Week
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### Topic

Nuclear Chemistry

### Essential Questions

- How are the different types of radiation used to write nuclear equations?
- How can radioactivity be both beneficial and harmful?
- What is half-life of a radioactive element?

### Enduring Understandings

- Explain what a nuclide is, and describe the different ways nuclides can be represented.
- Define and relate the terms mass defect and nuclear binding energy.
- Explain the relationship between number of nucleons and stability of nuclei.
- Explain why nuclear reactions occur, and know how to balance a nuclear equation.
- Define the term half-life, and explain how it relates to the stability of a nucleus.
- Discuss applications of radioactive nuclides.
- Compare and contrast nuclear fission and fusion.

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### Alignment to Standards

- HS-PS1-1
- HS-PS1-3
- HS-PS1-8

### Learning Activities & Key Concepts and Skills

- Develop models based on evidence 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.
- Model with mathematics
- Reason abstractly and quantitatively
- Discuss the pros and cons of using nuclear energy / radiation

### Assessments

#### Formative:

- Think-Pair-Share
- Do Now
- Strategic Questioning
- Lesson Check

#### Summative:

- Laboratory Work
  - Half-Life of Pennium w/ graph
  - Radioactive Decay Cards- Simulation the decay series of Uranium-238
- Quiz – Nuclear Chemistry
- Test – Atomic Structure & Nuclear Chemistry

#### Benchmark

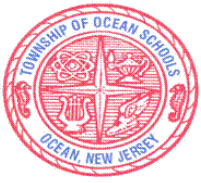
#### Alternative

- Nuclear Chemistry Project – Students will pick a topic (ex dirty Bombs, Medical isotopes) and research it online. Students will then choose a media platform that will best suit their project needs.

### Career Education

- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the

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chemistry lab

- CRP-12- Students will demonstrate skills acquired in class through lab work

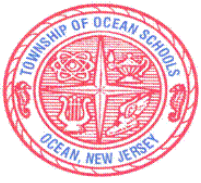
### 21st Century Skills

9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

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.

### Interdisciplinary Connections

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- LA.9-10RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures
- LA.9-10.RH.9-10.4- ChemMatters article- “The New Alchemy”-Students will read the text, a answer specific questions.
- MA.9-12.N-Q.A.1- Students will use units to understand what is being measured and to correctly solve math problems.

## Technology Integration

- TECH.8.1.12.C.- & TECH.8.1.12.D.5- Nuclear Chemistry Web quest. - Students will use the internet to research how nuclear chemistry is used and the effects it may have on the environment and the human body.
- TECH.8.1.12.C.- Gizmo- Nuclear Decay & Half Life– Students will access the Gizmo software program to further investigate lesson concepts.

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Time Frame	1 Week
<b>Topic</b>	
Quantum Chemistry (Electromagnetic Spectrum & Light)	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>• What is electromagnetic radiation?</li><li>• What are the mathematical relationships between speed of light, wavelength, and frequency?</li><li>• How is Planck's constant used to solve for the energy of light?</li><li>• How does the atomic spectra of an element correlate with energy levels of an atom?</li><li>• What are the 4 quantum numbers and how are they significant?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>• By studying the electromagnetic spectrum, students will be able to compare the wavelength of radiation with its energy.</li><li>• By studying the electromagnetic spectrum students will understand that electrons can only absorb or emit a specific amount of energy.</li><li>• Describe atomic orbitals in terms of their shape, size, and energy.</li></ul>	
<b>Alignment to Standards</b>	
<ul style="list-style-type: none"><li>• HS-PS1-1</li><li>• HS-PS1-3</li><li>• HS-PS1-4</li><li>• HS-PS1-7</li><li>• HS-PS4-1</li></ul>	
<b>Learning Activities &amp; Key Concepts and Skills</b>	
<ul style="list-style-type: none"><li>• Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations, one model is more useful than the other.</li><li>• Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling through space.</li><li>• Model with mathematics <math>C=\lambda\nu</math> &amp; <math>E=h\nu</math></li></ul>	

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- Reason abstractly and quantitatively
- Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations

### Assessments

#### **Formative:**

- Think-Pair-Share
- Do Now
- Strategic Questioning
- Lesson Check
- Minute Math Review

#### **Summative:**

- Laboratory Work
  - Flame Test Lab- Students will observe the characteristic colors produced by certain metallic ions when vaporized in a flame.
- Quiz – The EMS & Light Problems
- Quiz – Rydberg Equation- Honors only

#### **Benchmark**

#### **Alternative:**

- Electromagnetic Structure Book Project – Students create an EMS Book project to provide evidence of student learning of content and cognitive skills- Rubric

### Career Education

- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab
- CRP-12 - Students will demonstrate skills acquired in class through lab work or by creating the EMS Book Project.

### 21st Century Skills

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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.

### Interdisciplinary Connections

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- LA.9-10RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures while conducting the Flame Test Lab.
- LA.9-10.RH.9-10.4- ChemMatters article- “Fireworks”-Students will read the text, a answer specific questions.
- **MA.9-12.A-CED.A4 – Students will rearrange formulas to solve for wavelength, frequency, or Energy.**
- **MA.9-12.N-Q.A.1- Students will use units to understand what is being measured and to correctly solve math problems. (Light Equations & Rydberg Equation)**

### Technology Integration

- TECH.8.1.12.C.- Electromagnetic Spectrum GPB. - Students will use the internet to reinforce the concepts taught in class.
- TECH.8.1.12.C.- Gizmo- Bohr Model Introduction– Students will access the Gizmo software program to further investigate lesson concepts.

Time Frame	2 Weeks
Topic	
Electron Structure & The Periodic Table	
Essential Questions	
<ul style="list-style-type: none"><li>• What are sublevels and orbitals in an atom?</li><li>• How can students draw orbital diagrams and write electron configurations of an element?</li><li>• How can students write electron configurations for an atom using the sublevel blocks on the periodic table?</li><li>• How can we classify the elements on the periodic table into specific groups &amp; sublevels?</li><li>• How can students use the electron configurations of elements to explain the periodic trends?</li></ul>	
Enduring Understandings	

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- Students will demonstrate the understanding that an atom is composed of specific sublevels and orbitals.
- Students will demonstrate the understanding that sublevels fill in order of increasing energy.
- Use the periodic table to identify the groups and the period of an element and decide whether it is a metal, metalloid, or a nonmetal.
- Describe the sublevels and orbitals in atoms.
- Determine the electron configurations of several elements using the periodic table as a pattern.
- Draw the orbital diagram for various elements of the periodic table.
- Define periodic trend and identify the important periodic trends of the periodic table.

### Alignment to Standards

- HS-PS1-1
- HS-PS1-3
- HS-PS1-4
- HS-PS1-7

### Learning Activities & Key Concepts and Skills

- Demonstrate understanding of how to write electron configurations and orbitals diagrams for an element in both the ground and excited ion state.
- Draw Lewis Structures for atoms.
- Cite specific textual evidence to support analysis of science and technical text.
- Use the periodic table to identify the groups and the period of an element and decide whether it is a metal, metalloid, or a nonmetal.
- State the periodic law.
- Discuss contributions that scientists made to the periodic table.
- Explain why elements in a group have similar properties.
- Determine the number of electrons in an atom or ion

### Assessments

#### Formative:

- Think-Pair-Share
- Do Now

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- Strategic Questioning
- Lesson Check

### **Summative:**

- Laboratory Work
  - Color Code the Periodic Table Lab
  - Density is a Periodic Trend Lab with Graphing
- Quiz – Electron Configuration & The Periodic Table
- Test – The EMS, Light, Electron Structure, & The Periodic Table

### **Benchmark:**

### **Alternative:**

## Career Education

- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab
- CRP-12 – Students work productively during group work.

## 21st Century Skills

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.

## Interdisciplinary Connections

- LA.9-10.RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures while conducting:
  - Color Code the Periodic Table Lab.
  - Periodic Trends Lab
- LA.9-10.RH.9-10.4- ChemMatters article- “The Many Looks of the Periodic Table”- Students will read the text, and answer specific questions.
- MA.9-12.N-Q.A.1- Students will use units to understand what is being measured and to correctly solve math problems. Trends Lab requires density calculations)

## Technology Integration

- TECH.8.1.12.C.- Electron Configuration GPB. - Students will use the internet to reinforce the concepts taught in class.
  - Meet The Elements Web Quest

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- **TECH.8.1.12.C.- Gizmo- Electron Configuration–** Students will access the Gizmo software program to further investigate lesson concepts.

Time Frame	<b>1 Week</b>
<b>Topic</b>	
Chemical Bonding	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>• How can one explain the structure, properties, and interactions of matter?</li><li>• How can students 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?</li><li>• What is the octet rule for both atoms and ions?</li><li>• What is the difference between ionic bonding and covalent bonding?</li><li>• What are polyatomic ions?</li><li>• How can students use represent Lewis and resonance for molecules and ions?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>• Use the periodic table to obtain valence electrons for atoms.</li><li>• Using the octet rule, students will write the symbols of single ions for the representative elements.</li><li>• Represent both ionic and covalent bonding for various compounds</li><li>• Draw Lewis Structures and their resonance for molecules and polyatomic ions</li></ul>	
<b><u>Alignment to Standards</u></b>	
<ul style="list-style-type: none"><li>• <b>HS-PS1-1</b></li><li>• <b>HS-PS2-1</b></li></ul>	
<b>Learning Activities &amp; Key Concepts and Skills</b>	
<ul style="list-style-type: none"><li>• Apply scientific principles and evidence to provide an explanation about the type of bonding found in various compounds</li><li>• From the given model, students identify and describe the components of the model that are</li></ul>	

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relevant for:

- Elements and their arrangement in the periodic table
- Electrons in the outermost energy level of the atom and the number of protons present
- Using the octet rule, write the symbols for both atoms and the single ions for the representative elements.
- Describe the characteristics of both ionic and covalent bonding.
- Describe what a polyatomic ion is.

## Assessments

### **Formative:**

- Think-Pair-Share
- Do Now
- Strategic Questioning
- Lesson Check

### **Summative:**

- Laboratory Work
  - Electronic Cereal – Visual Aid to how valance electrons are arranged in an atom
  - Bonding POGIL
- Quiz – Bonding Quiz

### **Benchmark:**

**Alternative:** Chemical Bonding Project- Students will use art and creativity to explain the chemical processes of ionic and covalent bonding by creating a comic strip or a song.(Rubric)

## Career Education

- CRP-12 – Students work productively during group work.
- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab

## 21st Century Skills

## Interdisciplinary Connections

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- LA.9-10RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures while conducting:
  - Electronic Cereal
  - Bonding POGIL
- LA.9-10.RH.9-10.4- “Sticky situations: The Wonder of Glue”-Students will read the text, and answer specific questions.

### Technology Integration

- TECH.8.1.12.C.- Students will use their Chromebook to collect data on the properties of ionic and covalent compounds in order to classify substances as ionic or covalent
- TECH.8.1.12.C.- GIZMO - Covalent Bonding

Time Frame

**1 Week**

### Topic

Molecular Geometry (VSEPR) Theory & Intermolecular Forces

### Essential Questions

- How can students use Lewis structures to predict the geometry (shape), bond angle, hybridization, polarity and IMF of a molecule or polyatomic ion?
- How does hydrogen bonding affect our most important compound? Water.

### Enduring Understandings

- Describe the VSEPR Theory
- Identify the shapes of various molecules and polyatomic ions
- Explain what determines polarity of bonds and molecules.
- Understand hybridization, and how it relates to sigma and pi bonds.
- Explain and describe the different types of intermolecular forces and explain how they influence properties of liquids and solids.

### Alignment to Standards

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- **HS-PS1-1**
- **HS-PS2-1**

### Learning Activities & Key Concepts and Skills

- Apply scientific principles and evidence to provide an explanation about the type of bonding found in various compounds
- From the given model, students identify and describe the components of the model that are relevant for:
  - Elements and their arrangement in the periodic table
  - Electrons in the outermost energy level of the atom and the number of protons present
  - Using the octet rule, write the symbols for both atoms and the single ions for the representative elements.
- Use the VSEPR theory to make predictions about a molecule or polyatomic ion
- Use the VSEPR theory and polarity of a molecule to indicate the intermolecular forces that are present.

### Assessments

#### **Formative:**

- Think-Pair-Share
- Do Now
- Strategic Questioning
- Lesson Check
- Atom model kit or balloon geometries

#### **Summative:**

- Laboratory Work
  - Gum Drop Lab – VSEPR Theory
  - Properties of Water – IMF Lab
  - IMP POGIL
- Quiz – VSEPR theory & IMF (intermolecular forces)
- Test – Bonding Unit Test

#### **Benchmark:**

#### **Alternative :**

Career Education

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- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab
- CRP-12 – Students work productively during group work.

### 21st Century Skills

9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

### Interdisciplinary Connections

- LA.9-10.RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures while conducting:
  - Gum Drop Lab
  - Molecular Geometry POGIL and IMF POGIL
- **LA.9-10.RH.9-10.4- “Smells”:** Article about how the shapes of molecules affect odor.
- MA.9-12.G-MG – Geometry and VSEPR link

### Technology Integration

- TECH.8.1.12.C.--VSEPR GPB. - Students will use the internet to reinforce the concepts taught in class.

Time Frame

2 Weeks

### Topic

Chemical Formulas and Chemical Compounds

### Essential Questions

- How can formulas and English names be written for molecular compounds?
- How can formulas and English names be written for ionic binary and ternary compounds?
- How can formulas and English names be written for hydrate compounds?
- How can formulas and English names be written for binary acids and oxyacids?

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- What is an oxidation number, and how do we assign an oxidation number to atoms in a compound or polyatomic ion?

### Enduring Understandings

- Name and write formulas for various compounds containing polyatomic ions.
- Describe the characteristics of a covalent bond.
- Write names for molecular compounds using the prefix system.
- Explain how to identify a compound as either a binary or ternary acid.
- Describe how to name and write formulas for hydrates.
- Describe how to write formulas and name binary acids and oxyacids.

### Alignment to Standards

- **HS-PS1-1**
- **HS-PS2-1**

### Learning Activities & Key Concepts and Skills

- Identify and use the correct prefix and or suffix when naming compounds.
- Use roman numerals when appropriate to write formulas
- Apply the correct rules for naming and writing formulas for compounds.
- Identification of the type of chemical compound, including how to write their chemical formulas and their English names.
- Assign oxidation numbers to compounds and polyatomic ions in order to keep track of electrons being lost and gained when compounds are formed.

### Assessments

#### **Formative:**

- Think-Pair-Share
- Do Now
- Strategic Questioning
- Lesson Check
- Chem Cubes – dice nomenclature Game
- Go Fish for Ions Nomenclature Game

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### **Summative:**

- Laboratory Work
  - Cut and Paste Ions Lab
  - Dropper Lab – Chemical Nomenclature
  - Quiz – nomenclature
  - Test – Nomenclature and oxidation numbers

### **Benchmark:**

### **Alternative:**

- Chemical Compounds Project: Students will become better acquainted with writing names of chemical compounds and use of chemicals in everyday life in foods and products that they may use in their daily lives. (Rubric)

### Career Education

- CRP-12- Students work productively during group work
- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab

### 21st Century Skills

### Interdisciplinary Connections

- LA.9-10RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures while conducting:
  - Cut and Paste Ions Lab
  - Dropper Lab
  - Nomenclature POGIL

### Technology Integration

- TECH.8.1.12.C.- Nomenclature GPB (flipped classroom) - Students will use the internet to reinforce the concepts taught in class.

Time Frame

**1 Week**

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### Topic

The Math of Chemical Formulas - The Mole

### Essential Questions

- What is a mole and describe its importance in chemistry?
- What is molar mass and why is it important in chemical calculations?
- How can you convert among the number of moles, the mass of a sample, the volume of a gas, and the number of particles?
- What is the percent composition of a substance and how is it calculated?  
What is the difference between an empirical formula and a molecular formula

### Enduring Understandings

- Students should be able to write the definition of a mole and explain its importance.
- Students will demonstrate how to calculate the molar mass of a given chemical formula.
- Using molar mass and Avogadro's number, students will be able to complete various conversions using dimensional analysis.
- Students will calculate the mass percentage of each element in a compound.
- Students will demonstrate both empirical and molecular formulas.

### Alignment to Standards

- **HS-PS1-2**
- HS-PS1-3
- HS-PS1-4
- **HS-PS1-7**

### Learning Activities & Key Concepts and Skills

- Students identify and describe the relevant components in the mathematical representation:
- Quantities in terms of atoms, moles, and mass
- Molar mass of all compounds
- Apply mathematical modeling by using the mole to convert between various units
- Define a mole and describe its importance.
- Identify and use Avogadro's number.
- Define molar mass and explain how it relates the mass of a substance to the number of

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particles in the substance.

- Convert among the number of particles, moles, and the mass of a substance.
- Describe molar volume and use it to solve problems.
- Find the percent composition of a given formula.
- Use percent composition to determine the formula of an unknown sample.
  - Find empirical and molecular formulas.

## Assessments

### **Formative:**

- Think-Pair-Share
- Do Now
- Strategic Questioning
- Lesson Check
- Minute Math

### **Summative:**

- Laboratory Work
- Percent Composition of a Hydrate
  - Atomic Coatings
  - Cream of the Crop – A Percent Composition Activity
  - Candy Molecules Activity
  - Percent Sugar in Bubble Gum Lab
  - Molar Quantities Lab
  - Determining the Gram Atomic Mass of an Element
  - Determining an Empirical Formula
  - Mole Airlines
- Quiz- The Mole
- Test – The math of Chemical Formulas

### **Benchmark:**

### **Alternative:**

- Formulas in Everyday Life Project with rubric

## Career Education

- CRP-12- Students work productively during group work
- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab

## 21st Century Skills

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- PFL.9.1.12.B.1- Students will use 3 different brands of sandwich cookies (expensive to store brand) to calculate the percent composition of the cream filling, and identify the most cost effective brand based on percentage of cream in each sandwich cookie.

### Interdisciplinary Connections

- LA.9-10RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures while conducting Lab work.
- MA.9-12.N-Q.A.1- Students will use units to understand what is being measured and to correctly solve math problems using mole equalities and dimensional analysis.

### Technology Integration

- TECH.8.1.12.C:
  - The World of Chemistry – The Mole
  - Google Classroom flipped lesson on molar mass
- Flipped Classroom- GPB 701 (tutorial) – Introduction to the Mole and Molar Mass

Time Frame	<b>1 Week</b>
Topic	
Chemical Equations & Reactions	
Essential Questions	
<ul style="list-style-type: none"><li>● What are chemical reactions and why do they occur?</li><li>● How can chemical reactions be represented?</li><li>● How does a balanced chemical equation demonstrate the law of conservation of matter?</li><li>● What are the four general types of chemical reactions?</li><li>● What characteristics identify each type of a chemical reaction?</li><li>● What are oxidation numbers, and how are they assigned to an atom?</li></ul>	

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- What is being species oxidized and what species is being reduced in a redox reaction?

### Enduring Understandings

- Students should be able to describe the characteristics of a chemical reaction.
- Students will be able to distinguish between the reactants and the products in a chemical equation.
- Having students learn how to properly write a chemical equation will allow them to balance chemical equations and illustrate the law of conservation of matter.
- Students will be able to predict products for the 5 basic reaction types.
- Students will be able to distinguish the difference between oxidation and reduction.

### Alignment to Standards

- **HS-PS1-2**
- HS-PS1-3
- HS-PS1-4
- HS-PS1-7

### Learning Activities & Key Concepts and Skills

- Construct and revise an explanation for the outcome of simple chemical reactions based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
- Given new evidence or context, students construct a revised or expanded explanation about the outcome of a chemical reaction and justify the revision
- 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
- 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.
- Use mathematical representation to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
- Describe the characteristics of a chemical reaction by distinguishing between reactants and products.
- Explain how a chemical equation describes what happens in a chemical reaction.
- Write balanced chemical equations.
- Identify a reaction as a synthesis, decomposition, single replacement, double replacement, or combustion.

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### Assessments

#### **Formative:**

- Think-Pair-Share
- Do Now
- Strategic Questioning
- Lesson Check
- Launch Labs

#### **Summative:**

##### **Laboratory Work**

- Activity Series Lab
- Reactivity of Metals in Single –Replacement Reactions
- Bags of Reactions
- Atomic Coatings
- Evidence of a Chemical Reaction
- Types of Chemical Reactions
- LAB – AIDS #84 Identifications of Chemical Reactions Kit
- Classifying Chemical Reactions
- 11-3 Explore Feeling Left Out – Inquiry Activity
- Valentines Lab – Exploring Chemical Reactions
- Precipitation Lab – Using solubility Rules

#### **Quizzes:**

- Balancing and Classifying Equations
- Predicting Products (Advanced and Honors)

#### **Test:**

- Chemical Equations & Reactions

#### **Benchmark**

#### **Alternative**

### Career Education

- CRP-12- Students work productively during group work
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- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab

### 21st Century Skills

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9.3.12.ED.2 Demonstrate effective oral, written and multimedia communication in multiple formats and contexts.

### Interdisciplinary Connections

- LA.9-10RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures while conducting Lab work.
- MA.9-12.N-Q.A.1- Students will use units to understand what is being measured and to correctly solve math problems using mole equalities and dimensional analysis.

### Technology Integration

TECH.8.1.12.C:

- The World of Chemistry (video) – Reactions
- ChemBalancer (interactive tutorial)
- Flipped Classroom- GPB (tutorial)
  - 604 (Word Equations & Balancing)
  - 605 (Types of Reactions & Predicting Products)
- GIZMO – Chemical Equations

Time Frame	<b>1 Week</b>
Topic	
Stoichiometry The Math of Chemical Equations	
Essential Questions	
<ul style="list-style-type: none"><li>● What is stoichiometry?</li><li>● How are molar relationships represented in a balanced chemical equation?</li><li>● What are the main types of stoichiometry problems?</li><li>● What determines the amount of products formed in a chemical reaction?</li><li>● How is the percent yield of a chemical reaction determined?</li></ul>	

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### Enduring Understandings

- Students should be able to describe the characteristics of a chemical reaction.
- Students will be able to distinguish between the reactants and the products in a chemical equation.
- Having students learn how to properly write a chemical equation will allow them to balance chemical equations and illustrate the law of conservation of matter.
- By studying stoichiometry, students will be able to calculate various quantitative calculations in chemistry.
- Students will demonstrate how to obtain mole ratios from a correctly written and balanced equation.
- Students will be able to identify the limiting reactant, Excess reactant(s) and Theoretical yield in a chemical equation.
- Students will solve for the percent yield of a chemical reaction.

### Alignment to Standards

- **HS-PS1-2**
- HS-PS1-3
- HS-PS1-4
- HS-PS1-7

### Learning Activities & Key Concepts and Skills

- Explain how balanced equations apply, and to both chemistry and everyday life.
- Interpret balanced equations in terms of moles, representative particles, mass, and gas volume at STP.
- Identify the quantities that are always conserved in chemical reactions.
- Construct mole ratios from balanced chemical equations and apply these ratios in stoichiometric calculations.
- Calculate stoichiometric quantities from balanced chemical equations
- Identify the limiting reagent in a reaction.
- Calculate theoretical yield, actual yield, and percent yield given the appropriate information.

### Assessments

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### **Formative:**

- Think-Pair-Share
- Do Now
- Strategic Questioning
- Lesson Check
- Minute Math

### **Summative:**

- Stoichiometry POGIL
- Stoichiometry of S'Mores
- Stoichiometry Lab
- Determining Percent Yield in a Chemical Reaction Fe to Cu
- **Quiz**
  - Basic Mixed Stoichiometry
  - Quiz- Limiting Reactants, Theoretical Yield, & Percent Yield
- **Test**
  - Stoichiometry – Math of Chemical Equations
- **Benchmark:**
- **Alternative:**

### Career Education

- CRP-12- Students work productively during group work
- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab

### 21st Century Skills

- 9.3.12.ED- TT.5 Establish a positive climate to promote learning.
- 9.3.12.ED- TT.8 Demonstrate flexibility and adaptability in instructional planning.

### Interdisciplinary Connections

- LA.9-10RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures while conducting Lab work.
- MA.9-12.N-Q.A.1- Students will use units to understand what is being measured and to correctly solve math problems using mole equalities and dimensional analysis.
- MA.9-12.N-Q.A.3-Choose a level of accuracy appropriate to limitations on measurements

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when reporting quantities.

### Technology Integration

- TECH.8.1.12.C:
  - The World of Chemistry (video) – Molecules in Action
  - GIZMO – Student Exploration: Stoichiometry
  - Flipped Classroom- GPB (tutorial)
    - 801 (mole/mole & mole/mass Stoichiometry)
    - 802 (mass/mass Stoichiometry)

Time Frame

**1 Week**

### Topic

Thermochemistry & States of Matter

### Essential Questions

- In what direction does heat flow?
- How are the 3 temperature scales related?
- How does particle arrangement dictate the phases of matter?
- How is heat calculated given the mass, the change in temperature, and specific heats of substance?
- How are thermochemical equations written and used to calculate heat stoichiometry problems?
- How will students use and interpret heating and cooling curves?

### Enduring Understandings

- Students will be able to classify processes as exothermic or endothermic.
- Students will be able to convert between the three different temperature scales.
- Use the heat transfer equation to solve for the various variables using algebra.
- Students will be able to graph both heating and cooling curves, and calculate the total

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energy in the system

### Alignment to Standards

- **HS-PS1-2**
- HS-PS1-3
- HS-PS1-4
- HS-PS1-7

### Learning Activities & Key Concepts and Skills

- Describe the assumption of the kinetic molecular theory as it applies to gases.
- Define the relationship between Kelvin temperature and average kinetic energy.
- Evaluate how particles are arranged in the 3 states of matter.
- Distinguish between melting, freezing, vaporization, condensation, sublimation, and deposition.
- Explain how energy, heat, and work is related.
- Classify processes as either exothermic or endothermic.
- Identify the units used to measure heat transfer.
- Distinguish between heat capacity and specific heat.
- Describe how calorimeters are used to measure heat flow.
- Construct thermochemical equations.
- Calculate heat energy using  $q = m \times \Delta T \times c$
- Interpret a heating and cooling curve

### Assessments

#### Formative:

- Think-Pair-Share
- Do Now
- Strategic Questioning
- Lesson Check
- Minute math

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### **Summative:**

- Thermochemistry POGIL
- Energy in Junk Food Lab
- Specific Heat of Metal Lab
- Heating & Cooling Curve Lab
- Quiz – Thermochemistry
- Test – States of Matter & Thermochemistry

### **Benchmark:**

### **Alternative:**

#### Career Education

- CRP-12- Students work productively during group work
- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab

#### 21st Century Skills

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.

#### Interdisciplinary Connections

- LA.9-10RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures while conducting Lab work.
- MA.9-12.N-Q.A.1- Students will use units to understand what is being measured and to correctly solve math problems using algebra.
- MA.9-12.N-Q.A.3-Choose a level of accuracy appropriate to limitations on measurements when reporting quantities.
- MA.9-12.A-RE1.D.10 – Students will graph heating and cooling curves, then apply the heat transfer equation, heat of fusion, and heat of vaporization to calculate the total amount of energy lost or gained.

#### Technology Integration

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<ul style="list-style-type: none"><li>• <b>TECH.8.1.12.C:</b><ul style="list-style-type: none"><li>- The World of Chemistry (video) – Thermochemistry</li><li>- Movie- You tube- The Race to Absolute Zero</li><li>- GIZMO – Student Exploration: Calorimetry Lab Simulation</li><li>- Flipped Classroom- GPB (tutorial)<ul style="list-style-type: none"><li>▪ 1301 - Thermochemistry</li></ul></li></ul></li></ul>	
Time Frame	<b>1 Week</b>
<b>Topic</b>	
Gas Laws	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>• What is the kinetic molecular theory of gases?</li><li>• What are some distinctive properties of gases?</li><li>• What are the four gas variables and how are they expressed?</li><li>• How is gas pressure measured?</li><li>• How do the gas laws relate the variables P, V, n and T?</li><li>• What is the ideal gas equation and how is it applied?</li><li>• What is a real gas?</li><li>• Upon which variable does gas density depend?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>• Students will be able to describe the kinetic molecular theory and explain how it accounts for observed gas behavior.</li><li>• Students will be able to explain what gas pressure means and describe how it is measured.</li><li>• State the gas laws.</li><li>• Discuss the significance of the ideal gas equation.</li><li>• Compare ideal and real gases.</li><li>• Relate gas density to temperature and molar mass.</li></ul>	

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- Students will use algebra to solve for a specific variable in the gas laws.

### Alignment to Standards

- **HS-PS1-2**
- HS-PS1-3
- HS-PS1-4
- HS-PS1-7

### Learning Activities & Key Concepts and Skills

- Describe the nature of gases and recognize that gases have mass, can be compressed, exert pressure, occupy the space available to them, and diffuse rapidly.
- State the six postulates of the KMT and explain how they account for the physical properties of gases.
- Classifying, developing models, evaluating, making comparisons, drawing conclusions.
- Explain what gas pressure means and describe how it is measured.
- State the gas laws and use algebra to solve various gas law problems.
- Create graphical representations of the gas laws

### Assessments

#### **Formative:**

- Think-Pair-Share
- Do Now
- Strategic Questioning
- Lesson Check
- Minute math

#### **Summative:**

- Laboratory Work
  - Gas Laws POGIL
  - Exploring the Gas Laws Lab
  - Amount of Gas in Pop Rocks Lab
- Quiz – The Gas laws
- Test – Gas Laws Unit Test

#### **Benchmark:**

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### **Alternative:**

#### Career Education

- CRP-12- Students work productively during group work
- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab

#### 21st Century Skills

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.

#### Interdisciplinary Connections

- LA.9-10.RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures while conducting Lab work.
- LA.9-10.WHST.9-10.4
  - Article- “Hot Air Balloons - Gases & Go”
- MA.9-12.N-Q.A.1- Students will use units to understand what is being measured and to correctly solve math problems using algebra.
- MA.9-12.N-Q.A.3-Choose a level of accuracy appropriate to limitations on measurements when reporting quantities.
- MA.9-12.A-RE1.D.10 – Students will graph Boyles’s and Charles’ gas laws.

#### Technology Integration

- TECH.8.1.12.C:
  - Gas Laws Web quest
  - GIZMO – Student Exploration: Gas Laws Lab Simulation
  - Flipped Classroom- GPB (tutorial)
    - GPB 901- KMT & Atmospheric Pressure
    - GPB 902- The Gas Laws
    - GPB 903- Gas Behavior

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Time Frame	<b>1 Week</b>
<b>Topic</b>	
Solutions, Acids & Bases, Chemical Equilibrium, & Reaction Rates	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>• What is a solution?</li><li>• How is concentration of a solution described?</li><li>• How does a saturated solution differ from a supersaturated solution?</li><li>• What is solubility?</li><li>• What factors affect the rate of dissolving?</li><li>• What are four colligative properties of solutions?</li><li>• What is a reversible reaction?</li><li>• How is chemical equilibrium characterized?</li><li>• What is an equilibrium constant and what does it indicate?</li><li>• How are reactions quotients related to equilibrium constants?</li><li>• What is Le Chatelier's Principle</li><li>• What are some common properties of acids and bases?</li><li>• What is the Bronsted-Lowry definition of acids and bases?</li></ul>	
<b>Enduring Understandings</b>	

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- Students should be able to classify solutions as dilute, concentrated, and as a supersaturated solution, and use both molarity and molality to calculate solution concentration
- Students will be able to interpret a solubility curve,
- Students will use the colligative properties of solutions to calculate boiling point elevation and freezing point depression.
- Students will be able to write an equilibrium expression for a reversible chemical reaction.
- Students will be able to predict the shift in equilibrium position of reactions when a stressor is added.
- Students will be able to classify substances as acids or bases based on their properties.

## Alignment to Standards

- **HS-PS1-2**
- HS-PS1-3
- HS-PS1-4
- HS-PS1-6

## Learning Activities & Key Concepts and Skills

- Describe the properties of solutions
- Identify the different types of solutions.
- Measure the concentration of solutions in terms of molarity and molality.
- Differentiate among saturated, unsaturated, and supersaturated solutions.
- Explain how solutions form.
- Define solubility and describe the factors that affect solubility.
- Describe the factors that affect the rate at which a solute dissolves in a solvent.
- Describe a colligative property of a solution.
- Calculate boiling point elevations and freezing point depression of a solution.
- Describe a reversible reaction.
- Describe chemical equilibrium and explain how it is achieved.
- Determine the equilibrium constant for a given reaction.
- 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.(include equilibrium-Le Chatelier's Principle)

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### Assessments

#### **Formative:**

- Think-Pair-Share
- Do Now
- Strategic Questioning
- Lesson Check
- Minute math

#### **Summative:**

- Laboratory Work/Activities
  - Solutions Web Quest
  - Solubility of a Salt Lab
  - Types of Solutions Discovery Activity
  - Ice Cream Colligatives Lab
  - Chemical Equilibrium and Le Chatelier's Lab
  - Acid – Base Titration Lab
- Quiz – Solutions, Equilibrium, and Acids & Bases

#### **Benchmark:**

- End of course skills Benchmark
- Final Exam

#### **Alternative:**

- Final Project/Research PBL – Chemist Research Project
- Semester Project – Create a photo journal, music video, instructional video, children's book, comic strip based on a major area in which we worked on this semester
- Independent Study – Using Flipped classroom (you tube videos) students will explore Acids, bases, and salts, The PH scale, Reaction Rates, and Chemical equilibrium

### Career Education

- CRP-12- Students work productively during group work
- CRP-2 – Students will work collaboratively during lab work
- CRP-4 – Students will represent understanding of safe lab practices while working in the chemistry lab

### 21st Century Skills

- 9.3.12.ED.2- Students will demonstrate effective oral and written, and multimedia communications in multiple formats and contexts when presenting the alternative semester project.
- 9.3.12.ED-TT.8 – Students will use time management skills while working on projects

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### Interdisciplinary Connections

- LA.9-10RST.9-10.3- Students will have to read and interpret specific written text in order to follow lab procedures while conducting Lab work.
  - LA.9-10.WHST.9-10.4
    - Article- Chem Matters- “Salting Roads – The Solution for Winter Driving”
    - Article – Chem Matters- “Swimming Pool Chemistry – Acids & Bases”
  - MA.9-12.N-Q.A.1- Students will use units to understand what is being measured and to correctly solve math problems using algebra.
  - MA.9-12.N-Q.A.3-Choose a level of accuracy appropriate to limitations on measurements when reporting quantities.
- MA.9-12.A-RE1.D.10 – Students will graph and interpret a solubility curve**

### Technology Integration

- TECH.8.1.12.C:
  - GIZMO – Student Exploration: PH Analysis
  - Flipped Classroom- GPB (tutorial)
    - GPB 1101- Introduction to Acids and Bases
    - GPB 1102- Indicators and the PH Scale
    - GPB 1202 – Le Chatelier’s Principle,  $K_{eq}$

Time Frame

**1 Week**

### Topic

Final Exam

### Essential Questions

- Summation of entire course- See each unit’s Essential Questions.

### Enduring Understandings

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- Summation of entire course – See each unit’s Enduring Understandings

### Alignment to Standards

- Summation of entire course- see each unit’s Alignment to Standards

### Learning Activities & Key Concepts and Skills

- Test students overall content knowledge for proficiency in chemistry
- Students will apply chemical and physical principles to solve problems.

### Assessments

#### **Formative:**

- Final Exam Study Guide

#### **Summative:**

- Final Exam

#### **Benchmark:**

- End of course skills Benchmark

### Career Education

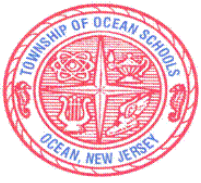
### 21st Century Skills

### Interdisciplinary Connections

**See all previous connections**

### Technology Integration

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TECH.8.1.12A-1- Additional resources and extension activities will be posted on Google Classroom in order to reflect on learning and review their knowledge.

### **Modifications (ELL, Special Education, At-Risk Students, Gifted & Talented, & 504 Plans)**

#### ***ELL:***

- Work toward longer passages as skills in English increase
- Use visuals
- Introduce key vocabulary before lesson
- Teacher models reading aloud daily
- Provide peer tutoring
- Use of Bilingual Dictionary
- Guided notes and/or scaffold outline for written assignments
- Provide students with English Learner leveled readers.

#### ***Supports for Students With IEPs:***

- Allow extra time to complete assignments or tests
- Guided notes and/or scaffold outline for written assignments
- Work in a small group
- Allow answers to be given orally or dictated
- Use large print books, Braille, or books on CD (digital text)
- Follow all IEP modifications

#### ***At-Risk Students:***

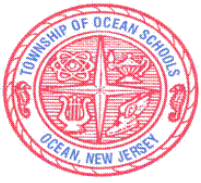
- Guided notes and/or scaffold outline for written assignments
- Introduce key vocabulary before lesson
- Work in a small group
- Lesson taught again using a differentiated approach
- Allow answers to be given orally or dictated
- Use visuals / Anchor Charts
- Leveled texts according to ability

#### ***Gifted and Talented:***

- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum

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- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use center, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Expose students to beyond level texts.

### ***Supports for Students With 504 Plans:***

- Follow all the 504 plan modifications
- Text to speech/audio recorded selections
- Amplification system as needed
- Leveled texts according to ability
- Fine motor skill stations embedded in rotation as needed
- Modified or constrained spelling word lists
- Provide anchor charts with high frequency words and phonemic patterns

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