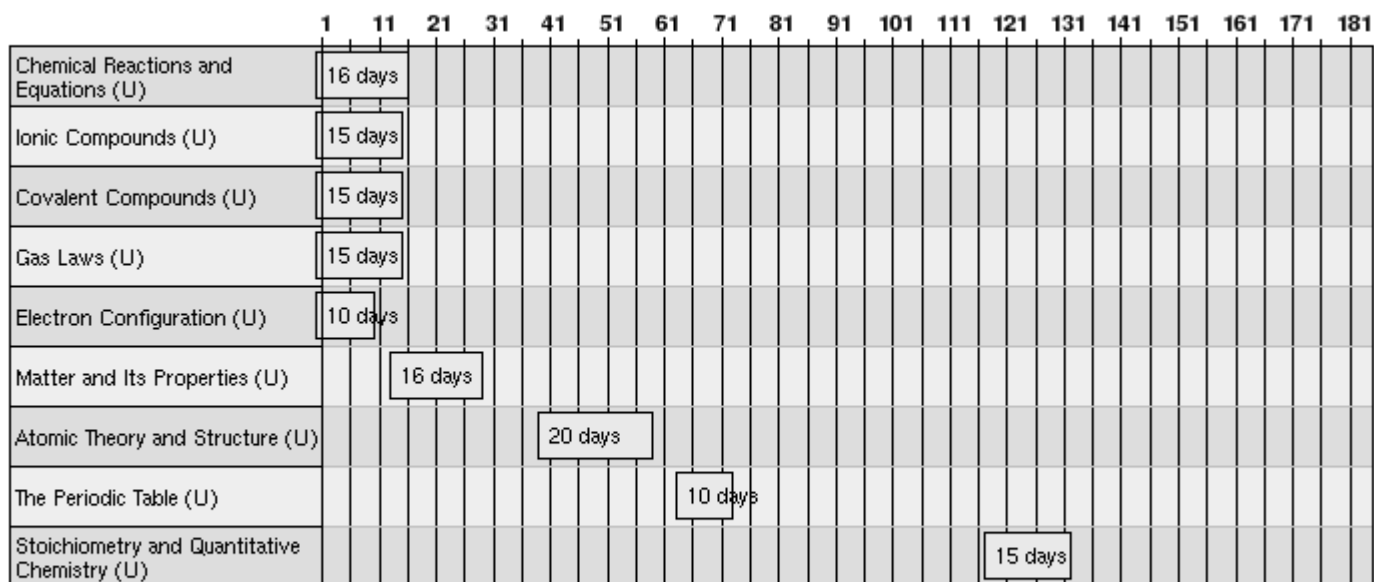


# Folder: Science

Group/District: PENNSYLVANIA

## Course Map Timeline Science - Chemistry



Essential (E)  
  Important (I)  
  Compact (C)  
  Unranked (U)

Topic: Atomic Theory and Structure

Days: 20

Subject(s): Science

Grade(s): 10th, 11th

## Key Learning:

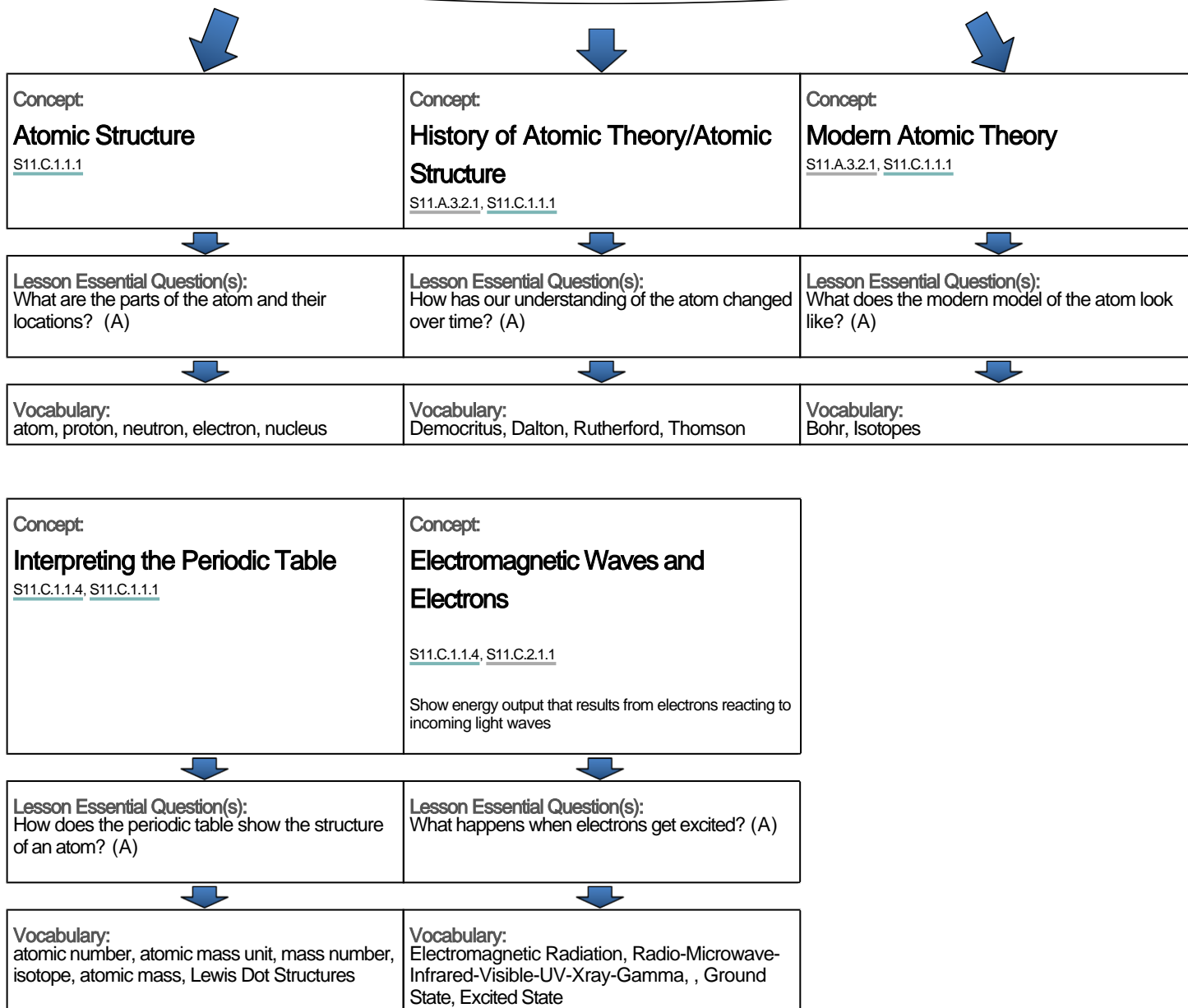
The subatomic particles of an element determine its properties.

Note: Referenced Lesson Plans can be found in the attachments under the Learning Map in the Matter Unit



## Unit Essential Question(s):

How is the study of atomic structure the basis for the study of Chemistry?



Topic: Atomic Theory and Structure

Days: 20

Subject(s): Science

Grade(s): 10th, 11th

Additional Information:

Attached Document(s):

Vocab Report for Topic: Atomic Theory and Structure

Subject(s): Science

Days: 20

Grade(s): 10th, 11th

### Concept: History of Atomic Theory/Atomic Structure

Democritus -  
Dalton -  
Rutherford -  
Thomson -

### Concept: Modern Atomic Theory

Bohr -  
Isotopes -

### Concept: Interpreting the Periodic Table

atomic number -  
atomic mass unit -  
mass number -  
isotope -  
atomic mass -  
Lewis Dot Structures -

### Concept:

#### Electromagnetic Waves and Electrons

Electromagnetic Radiation -  
Radio-Microwave-Infrared-Visible-UV-Xray-Gamma -  
-

Lin / Absorption Spectra

Ground State -  
Excited State -

### Concept: Atomic Structure

atom -  
proton -  
neutron -  
electron -  
nucleus -

Topic: Chemical Reactions and Equations

Days: 16

Subject(s): Science

Grade(s): 11th

Key Learning: Chemical reactions are predictable.



Unit Essential Question(s): **What are the factors and principles we can use to predict the outcome of reactions?**

<p>Concept: <b>How to Identify Chemical Reactions</b> S11.C.1.1.3</p>	<p>Concept: <b>Writing Chemical Reactions</b> S11.C.1.1.3, S11.C.2.1.2</p>	<p>Concept: <b>Balancing Chemical Reactions</b> S11.C.1.1.3</p>
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<p>Lesson Essential Question(s): What observations can be made that point to a chemical reaction? (A)</p>	<p>Lesson Essential Question(s): How can I put a chemical equation into words? (A)</p>	<p>Lesson Essential Question(s): How do I balance a chemical reaction to prove the conservation of matter? (A)</p>
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<p>Vocabulary: Chemical Reaction, Chemical Change, Physical Change</p>	<p>Vocabulary: Reactant, Product</p>	<p>Vocabulary: Coefficient</p>
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<p>Concept: <b>Classifying Chemical Reactions</b> S11.C.1.1.3</p>	<p>Concept: <b>Equilibrium</b> S11.C.2.1.3, S11.C.1.1.6</p>	<p>Concept: <b>Reaction Rates</b> S11.C.2.1.2, S11.C.2.1.3, S11.C.1.1.6</p>
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<p>Lesson Essential Question(s): How do I place chemical reactions into the five categories? (A)</p>	<p>Lesson Essential Question(s): What factors result in a change in equilibrium? (A)</p>	<p>Lesson Essential Question(s): What factors can influence the rate of a reaction? (A)</p>
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<p>Vocabulary: Synthesis, Decomposition, Single-Displacement, Double-Displacement, Composition</p>	<p>Vocabulary: Equilibrium, Dynamic Equilibrium, Soluble, Insoluble</p>	<p>Vocabulary: Activation Energy, Concentration, Limiting Reactant, Catalyst, Enzyme, Inhibitor</p>
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Additional Information:

Attached Document(s):

Vocab Report for Topic: Chemical Reactions and Equations

Subject(s): Science

Days: 16

Grade(s): 11th

### **Concept: How to Identify Chemical Reactions**

Chemical Reaction -  
Chemical Change -  
Physical Change -

### **Concept: Writing Chemical Reactions**

Reactant -  
Product -

### **Concept: Balancing Chemical Reactions**

Coefficient -

### **Concept: Classifying Chemical Reactions**

Synthesis -  
Decomposition -  
Single-Displacement -  
Double-Displacement -  
Composition -

### **Concept: Equilibrium**

Equilibrium -  
Dynamic Equilibrium -  
Soluble -  
Insoluble -

### **Concept: Reaction Rates**

Activation Energy -  
Concentration -  
Limiting Reactant -  
Catalyst -  
Enzyme -  
Inhibitor -

Topic: Covalent Compounds

Days: 15

Subject(s):

Grade(s):

Key Learning: Covalent compounds have a unique system of nomenclature and common properties.

Unit Essential Question(s):

What makes covalent compounds unique?

<p>Concept: <b>Sharing of Electrons</b> <a href="#">S11.C.1.1.1</a>, <a href="#">S11.C.1.1.3</a>, <a href="#">S11.C.1.1.4</a></p>	<p>Concept: <b>Multiple Bonds</b> <a href="#">S11.C.1.1.3</a>, <a href="#">S11.C.1.1.1</a></p>	<p>Concept: <b>Writing Formulas for Covalent Compounds</b> <a href="#">S11.C.1.1.3</a>, <a href="#">S11.C.1.1.4</a></p>
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<p>Lesson Essential Question(s): How are the electrons arranged and shared in a covalent compound? (A)</p>	<p>Lesson Essential Question(s): How are electrons arranged when more than one pair is formed? (A)</p>	<p>Lesson Essential Question(s): How are the formulas for covalent compounds written? (A) <a href="#">S11.C.1.1.4</a></p>
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<p>Vocabulary: Covalent Bond, Covalent Compound, Molecule, Electrolyte, Interparticle Forces</p>	<p>Vocabulary: Double Bond, Triple Bond</p>	<p>Vocabulary: Molecular Substance</p>
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<p>Concept: <b>Nomenclature of Covalent Compounds</b> <a href="#">S11.C.1.1.3</a></p>	<p>Concept: <b>Properties of Covalent Compounds</b> <a href="#">S11.C.1.1.3</a></p>	<p>Concept: <b>Comparing Ionic and Covalent Compounds</b> <a href="#">S11.C.1.1.3</a>, <a href="#">S11.C.1.1.4</a></p>
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<p>Lesson Essential Question(s): How are covalent compounds named? (A) <a href="#">S11.C.1.1.3</a></p>	<p>Lesson Essential Question(s): What properties do covalent compounds have in common? (A)</p>	<p>Lesson Essential Question(s): What properties can be used to distinguish between ionic and covalent compounds? (A)</p>
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<p>Vocabulary:</p>	<p>Vocabulary: Distillation, Molecular Element, Allotrope</p>	<p>Vocabulary:</p>
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Additional Information:

Attached Document(s):

Vocab Report for Topic: Covalent Compounds

Days: 15

Subject(s):

Grade(s):

**Concept: Sharing of Electrons**

Covalent Bond -  
Covalent Compound -  
Molecule -  
Electrolyte -  
Interparticle Forces -

**Concept: Multiple Bonds**

Double Bond -  
Triple Bond -

**Concept: Writing Formulas for Covalent Compounds**

Molecular Substance -

**Concept: Properties of Covalent Compounds**

Distillation -  
Molecular Element -  
Allotrope -



Topic: Electron Configuration

Days: 10

Subject(s): Science

Grade(s): 11th

**Key Learning:** Electrons are arranged in an atom based on the amount of energy they obtain.

Electrons are placed in shells, subshells, orbitals, and spins based on an ordered system.

Unit Essential Question(s):

**How are electrons arranged around a nucleus?**

<p>Concept: <b>Developing the Atomic Model</b> <a href="#">S11.C.1.1.1</a></p>	<p>Concept: <b>Electromagnetic Radiation</b> <a href="#">S11.C.2.1.1</a></p>	<p>Concept: <b>Distribution of Electrons - Shells, Subshells, and Orbitals</b> <a href="#">S11.C.1.1.2</a>, <a href="#">S11.C.1.1.1</a>, <a href="#">S11.C.2.1.1</a></p>
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<p>Lesson Essential Question(s): How has the model of the atom developed over time? (A)</p>	<p>Lesson Essential Question(s): How do electrons emit radiation? (A)</p>	<p>Lesson Essential Question(s): How are electrons arranged in shells, subshells, and orbitals? (A)</p>
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<p>Vocabulary: Dalton, Thomson, Rutherford, Bohr, Modern Atomic Model</p>	<p>Vocabulary: Electromagnetic Radiation</p>	<p>Vocabulary: Shell, Subshell, Orbital, Heisenberg Uncertainty Principle, Electron Configuration</p>
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<p>Concept: <b>Drawing Electron Configurations</b> <a href="#">S11.C.1.1.1</a></p>	<p>Concept: <b>Writing Electron Configurations</b> <a href="#">S11.C.1.1.1</a></p>	<p>Concept: <b>Patterns in Atomic Structure</b> <a href="#">S11.C.1.1.1</a>, <a href="#">S11.C.1.1.2</a>, <a href="#">S11.C.2.1.1</a></p>
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<p>Lesson Essential Question(s): How can we represent the arrangement of electrons as pictures? (A)</p>	<p>Lesson Essential Question(s): How can we put the arrangement of electrons into writing? (A)</p>	<p>Lesson Essential Question(s): How is atomic structure demonstrated by the periodic table? (A)</p>
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<p>Vocabulary:</p>	<p>Vocabulary:</p>	<p>Vocabulary: Inner Transition Element</p>
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Additional Information:

Attached Document(s):

Vocab Report for Topic: Electron Configuration

Subject(s): Science

Days: 10

Grade(s): 11th

**Concept: Developing the Atomic Model**

Dalton -  
Thomson -  
Rutherford -  
Bohr -  
Modern Atomic Model -

**Concept: Electromagnetic Radiation**

Electromagnetic Radiation -

**Concept: Distribution of Electrons - Shells, Subshells, and Orbitals**

Shell -  
Subshell -  
Orbital -  
Heisenberg Uncertainty Principle -  
Electron Configuration -

**Concept: Patterns in Atomic Structure**

Inner Transition Element -

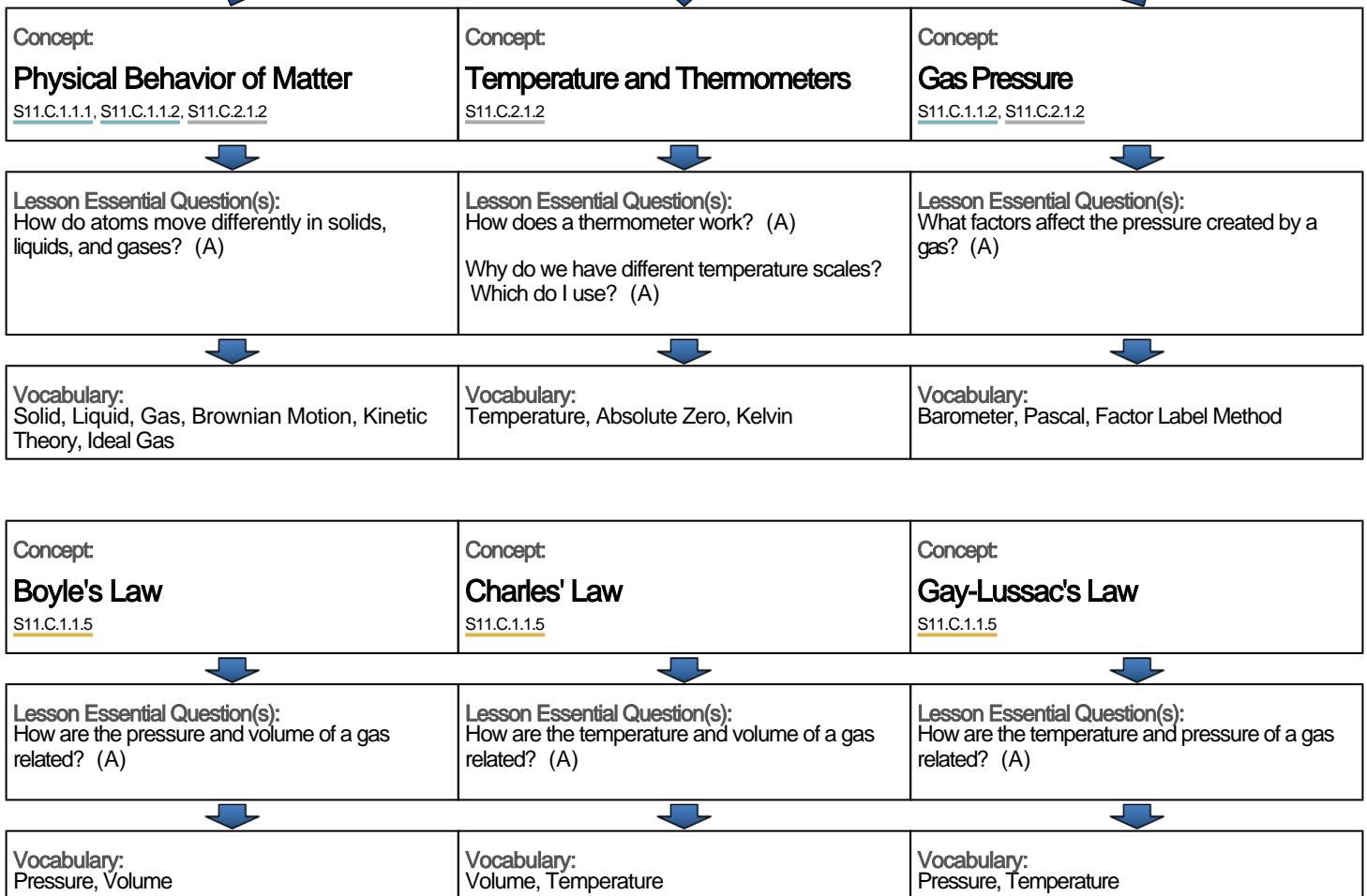
Topic: Gas Laws  
 Subject(s):

Days: 15  
 Grade(s):

Key Learning: The properties of gases can be predicted through a series of gas laws.



Unit Essential Question(s): **How can we calculate the properties of gases using the Gas Laws?**









Topic: Gas Laws

Days: 15

Subject(s):

Grade(s):

Concept: <b>Combined Gas Law</b> <u>S11.C.1.1.5</u>	Concept: <b>Avogadro's Principle</b> <u>S11.C.1.1.5</u>	Concept: <b>Ideal Gas Law</b> <u>S11.C.1.1.5</u>
		
Lesson Essential Question(s): How are volume, pressure, and temperature related? (A)	Lesson Essential Question(s): What unit do we use to measure the amount of a gas? (A)	Lesson Essential Question(s): How are volume, pressure, temperature, and the amount of a gas related? (A)
		
Vocabulary: Pressure, Volume, Temperature	Vocabulary: Molecule, Mole	Vocabulary: Pressure, Volume, Temperature, Mole

Additional Information:

Attached Document(s):

Vocab Report for Topic: Gas Laws

Days: 15

Subject(s):

Grade(s):

**Concept: Physical Behavior of Matter**

Solid -  
Liquid -  
Gas -  
Brownian Motion -  
Kinetic Theory -  
Ideal Gas -

**Concept: Temperature and Thermometers**

Temperature -  
Absolute Zero -  
Kelvin -

**Concept: Gas Pressure**

Barometer -  
Pascal -  
Factor Label Method -

**Concept: Boyle's Law**

Pressure -  
Volume -

**Concept: Charles' Law**

Volume -  
Temperature -

**Concept: Gay-Lussac's Law**

Pressure -  
Temperature -

**Concept: Combined Gas Law**

Pressure -  
Volume -  
Temperature -

**Concept: Avogadro's Principle**

Vocab Report for Topic: Gas Laws

Days: 15

Subject(s):

Grade(s):

Molecule -

Mole -

**Concept: Ideal Gas Law**

Pressure -

Volume -

Temperature -

Mole -

Topic: Ionic Compounds

Days: 15

Subject(s):

Grade(s):

**Key Learning:** Ionic bonds are formed by electron transfer. Ionic bonds are named with a uniform, ordered nomenclature.



Unit Essential Question(s):

**Why are sodium chloride and water different?**

<p>Concept: <b>Properties of Compounds: Salt, Carbon Dioxide, Water</b> <u>S11.C.1.1.1</u></p>	<p>Concept: <b>Achieving Stability - Noble Gases</b> <u>S11.C.1.1.2, S11.C.1.1.3, S11.C.1.1.1</u></p>	<p>Concept: <b>Writing Ionic Formulas</b> <u>S11.C.1.1.3</u></p>
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<p>Lesson Essential Question(s): Why are compounds made of the same elements so different? (A)</p>	<p>Lesson Essential Question(s): What makes a noble gas so snobby? (A)</p>	<p>Lesson Essential Question(s): How do I determine the formula for an ionic compound? (A)</p>
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<p>Vocabulary:</p>	<p>Vocabulary: Octet Rule, Noble Gas Configuration, Ion, Ionic Compound, Ionic Bond</p>	<p>Vocabulary:</p>
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<p>Concept: <b>Naming Ionic Compounds</b> <u>S11.C.1.1.3</u></p>	<p>Concept: <b>Polyatomic Ions and Transition Metals</b> <u>S11.C.1.1.3</u></p>	<p>Concept: <b>Properties of Ionic Compounds</b> <u>S11.C.1.1.2, S11.C.1.1.3</u></p>
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<p>Lesson Essential Question(s): What is the proper nomenclature for ionic compounds? (A)</p>	<p>Lesson Essential Question(s): How do polyatomic ions and transition metals differ in nomenclature? (A)</p>	<p>Lesson Essential Question(s): What are the common properties of ionic compounds? (A)</p>
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<p>Vocabulary: Binary Compound, Formula Unit, Oxidation Number</p>	<p>Vocabulary: Polyatomic Ion, Transition Metal</p>	<p>Vocabulary: Crystal Lattice, Hydrate, Hygroscopic, Deliquescent, Anhydrous</p>
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**Additional Information:**

**Attached Document(s):**

Vocab Report for Topic: Ionic Compounds

Days: 15

Subject(s):

Grade(s):

**Concept: Achieving Stability - Noble Gases**

Octet Rule -  
Noble Gas Configuration -  
Ion -  
Ionic Compound -  
Ionic Bond -

**Concept: Naming Ionic Compounds**

Binary Compound -  
Formula Unit -  
Oxidation Number -

**Concept: Polyatomic Ions and Transition Metals**

Polyatomic Ion -  
Transition Metal -

**Concept: Properties of Ionic Compounds**

Crystal Lattice -  
Hydrate -  
Hygroscopic -  
Deliquescent -  
Anhydrous -



Topic: Matter and Its Properties

Days: 16

Subject(s): Science

Grade(s): 11th

## Key Learning:

Chemistry is the study of matter; matter can be classified as mixtures, elements or compounds with unique chemical and physical properties.

Note: Referenced Lesson Plans are found in the Attachments at the bottom of this screen



## Unit Essential Question(s):

Is a change a chemical or a physical reaction?

Concept: <b>Classification of Matter</b> <a href="#">S11.C.1.1.1</a> , <a href="#">S11.C.1.1.2</a>	Concept: <b>Chemical and Physical Properties/ Changes</b> <a href="#">S11.C.1.1.2</a>	Concept: <b>Models in Chemistry</b> <a href="#">S11.A.3.2.1</a>
Lesson Essential Question(s): How is matter classified? (A)	Lesson Essential Question(s): How are chemical and physical changes/ properties distinguished? (A)	Lesson Essential Question(s): How can we represent chemistry concepts with models? (A)
Vocabulary: element, compound, mixture, matter, Substance	Vocabulary: physical property, chemical property, changes of state, gas, liquid, solid	Vocabulary: scientific model, ball-and-stick model

Concept: <b>Types of Mixtures</b> <a href="#">S11.C.1.1.2</a>
Lesson Essential Question(s): How do I classify the types of mixtures? (A)
Vocabulary: Homogeneous, Heterogeneous

Additional Information:

Attached Document(s):

Vocab Report for Topic: Matter and Its Properties

Subject(s): Science

Days: 16

Grade(s): 11th

### **Concept: Classification of Matter**

- element -
- compound -
- mixture -
- matter -
- Substance -

### **Concept: Chemical and Physical Properties/Changes**

- physical property -
- chemical property -
- changes of state -
- gas -
- liquid -
- solid -

### **Concept: Models in Chemistry**

- scientific model -
- ball-and-stick model -

### **Concept: Types of Mixtures**

- Homogeneous -
- Heterogeneous -

Topic: The Periodic Table  
 Subject(s): Science

Days: 10  
 Grade(s): 10th, 11th

**Key Learning:**

The periodic table provides a graphic representation of trends and properties of the elements. The periodic table is used to predict relationships between elements.



Unit Essential Question(s):

**How is the periodic table organized?**



**Concept:**

**Historical Development of the Periodic Table**

S11.C.1.1.1, S11.C.1.1.2, S11.A.3.2.1

**Concept:**

**The Modern Periodic Table**

S11.C.1.1.1, S11.C.1.1.2, S11.A.3.2.1, S11.A.3.2.3

**Concept:**

**Relationship to Atomic Structure**

S11.C.1.1.4, S11.C.1.1.1, S11.C.1.1.2, S11.A.3.2.3, S11.A.3.3.1



**Lesson Essential Question(s):**

How has the periodic table changed over time? (A)

**Lesson Essential Question(s):**

How is the current periodic table arranged? (A)

**Lesson Essential Question(s):**

What are the trends in atomic structure in the periods and groups of the table? (A)



**Vocabulary:**

Dobereiner, Mendeleev, periodicity

**Vocabulary:**

Periodic Law

**Vocabulary:**

period, group, noble gases, halogen

**Concept:**

**Metals, Nonmetals, Metalloids**

S11.C.1.1.4, S11.A.3.3.1



**Lesson Essential Question(s):**

Where are the groups of metals, nonmetals, and metalloids located on the table? (A)



**Vocabulary:**

metal, transition metal, lanthanide, actinide, nonmetal, metalloid, semiconductor

**Additional Information:**

**Attached Document(s):**

Vocab Report for Topic: The Periodic Table

Subject(s): Science

Days: 10

Grade(s): 10th, 11th

**Concept: Historical Development of the Periodic Table**

Dobereiner -  
Mendeleev -  
periodicity -

**Concept: The Modern Periodic Table**

Periodic Law -

**Concept: Relationship to Atomic Structure**

period -  
group -  
noble gases -  
halogen -

**Concept: Metals, Nonmetals, Metalloids**

metal -  
transition metal -  
lanthanide -  
actinide -  
nonmetal -  
metalloid -  
semiconductor -

Topic: Stoichiometry and Quantitative Chemistry

Days: 15

Subject(s): Science

Grade(s): 11th, 12th

Key Learning:

Mole relationships are used to solve problems in chemistry.



Unit Essential Question(s):

**How are problems quantitatively solved that involve chemical reactions?**



Concept:

**Molar Mass**

Concept:

**Stoichiometry**

Concept:

**Theoretical and Actual Yields**

Lesson Essential Question(s):

How do I calculate the mass of 1 mole of a compound? (A)

Lesson Essential Question(s):

How are quantitative problems solved that involve chemical equations? (A)

Lesson Essential Question(s):

How can we predict the amount of products formed in a chemical reaction? (A)



Vocabulary:

Mole, molar mass, molar volume of a gas

Vocabulary:

stoichiometry, , Limiting Reagent

Vocabulary:

, Theoretical Yield, Actual Yield, Percent Yield

Concept:

**Determining Chemical Formulas**

Lesson Essential Question(s):

How can I use math to determine the formula of a compound? (A)



Vocabulary:

Molecular Formula, Empirical Formula

Additional Information:

Attached Document(s):

Vocab Report for Topic: Stoichiometry and Quantitative Chemistry

Subject(s): Science

Days: 15

Grade(s): 11th, 12th

**Concept: Molar Mass**

Mole -  
molar mass -  
molar volume of a gas -

**Concept: Stoichiometry**

stoichiometry -  
-

Factor Labeling (Dimensional Analysis)

Limiting Reagent -

**Concept: Theoretical and Actual Yields**

-  
Theoretical Yield -  
Actual Yield -  
Percent Yield -

**Concept: Determining Chemical Formulas**

Molecular Formula -  
Empirical Formula -