

Topic: Aqueous Solutions  
 Subject(s): Science

Days: 15  
 Grade(s): 10th, 11th, 12th

Key Learning:

Aqueous solutions are those dissolved in water and the dissolution has many applications.



Unit Essential Question(s):

How are aqueous solutions made?



Concept:

**Properties of Solutions**

3.1.12.B, 3.4.12.A

Concept:

**Acids/Base Reactions**

3.1.12.B, 3.4.12.A

Concept:

**Aqueous Reactions (Redox/Precip)**

3.1.12.B, 3.4.12.A



Lesson Essential Question(s):

What is a solution? What are its parts? (A)

What is a strong, weak, and non-electrolyte? (A)

What is dissociation? (A)

What is the difference between dissociate and dissolve? (A)

What type of compounds dissociate in water? (A)

What is molarity? (A)

Lesson Essential Question(s):

What ions in solution makes an acid/base? (A)

What is the pH of an acid and base solution? (A)

What are the products of an acid and base reaction? (A)

What is neutralization? (A)

Lesson Essential Question(s):

How can you determine if a precipitation reaction will occur? (A)

How do you write a net ionic equation for a reaction? (ET)

What is the difference between oxidation and reduction? (A)

How is the activity series used to determine if a metal is oxidized? (ET)



Vocabulary:

solute, solvent, saturated, unsaturated, super-saturated

Vocabulary:

titration, hydronium ion, end point, salt

Vocabulary:

precipitate

Additional Information:

Attached Document(s):

Vocab Report for Topic: Aqueous Solutions

Subject(s): Science

Days: 15

Grade(s): 10th, 11th, 12th

**Concept:**

Properties of Solutions

- solute -
- solvent -
- saturated -
- unsaturated -
- super-saturated -

**Concept: Acids/Base Reactions**

- titration -
- hydronium ion -
- end point -
- salt -

**Concept: Aqueous Reactions (Redox/Precip)**

- precipitate -

Topic: Chemical Bonding

Days: 30

Subject(s): Science

Grade(s): 10th, 11th, 12th

Key Learning:

The number of valence electrons determines the properties and types of bonds formed between elements.



Unit Essential Question(s):

How are sodium chloride and sucrose different?



Concept:

**Ionic and Covalent Bonding**

3.4.12.A, 3.1.12.A, 3.1.12.C

Concept:

**Lewis Structures**

3.1.12.A, 3.1.12.C, 3.4.12.A

Concept:

**Electron Configuration**

3.1.12.A, 3.1.12.C, 3.4.12.A



Lesson Essential Question(s):

What is the difference between ionic and covalent bonds? (A)

What types of elements are involved in each type of bond? (A)

What are the properties of ionic and covalent compounds? (A)

What is the difference between a polar and nonpolar bond? (A)

How does bond length affect strength of a bond? (A)

Lesson Essential Question(s):

How do you draw Lewis structures for elements and compounds? (A)

What is the difference between single, double, and triple bonds? (A)

What is the octet rule and why is it important? (ET)

What are shared pairs and lone pairs? (A)

What is the formal charge of a central atom? How is formal charge used to determine preferred structures? (ET)

What are the exceptions to the octet rule? (A)

Lesson Essential Question(s):

How is the ground state configuration of a neutral atom different from that of an ion? (A)

Identify and explain the group and period trends for ionic radius? (ET)

How do you use electron configuration to predict ionic compound formulas? (ET)



Vocabulary:

Octet rule

Vocabulary:

resonance

Vocabulary:

Topic: Chemical Bonding

Days: 30

Subject(s): Science

Grade(s): 10th, 11th, 12th

Concept:

## Molecular Geometry

3.1.12.A



Lesson Essential Question(s):

How is the VSEPR model used to determine molecular shape? (A)

How does molecular shape affect polarity? (A)

How is the molecular geometry determined from a chemical formula? (A)



Vocabulary:

Additional Information:

Attached Document(s):

Vocab Report for Topic: Chemical Bonding

Days: 30

Subject(s): Science

Grade(s): 10th, 11th, 12th

**Concept:**

Ionic and Covalent Bonding

Octet rule -

**Concept: Lewis Structures**

resonance -

Topic: Chemical Equations and Reactions

Days: 10

Subject(s): Science

Grade(s): 10th, 11th, 12th

Key Learning:

There are different types of chemical reactions and they are all governed by the Law of Conservation of Mass.



Unit Essential Question(s):

Why is it important to be able to balance and classify chemical equations?



Concept:

**Balancing Chemical Equations**

3.1.12.A



Concept:

**Classifying Chemical Equations**

3.4.12.A, 3.1.12.A, 3.1.12.B, 3.1.12.C



Lesson Essential Question(s):

Why must equations be balanced? (A)

What can be changed to balance a chemical equation? (A)

What is meant by a "balanced equation?" (ET)

How are redox equations balanced differently? (A)



Lesson Essential Question(s):

What are the types of chemical reactions? (A)

What are the keys to identifying chemical reactions? (A)

How are the products of a chemical reaction predicted? (ET)



Vocabulary:

coefficient, subscript, superscript

Vocabulary:

reactants, products, precipitate, combustion, synthesis, decomposition, double displacement, single displacement

Additional Information:

Attached Document(s):

Vocab Report for Topic: Chemical Equations and Reactions

Subject(s): Science

Days: 10

Grade(s): 10th, 11th, 12th

**Concept:**

**Balancing Chemical Equations**

- coefficient -
- subscript -
- superscript -

**Concept: Classifying Chemical Equations**

- reactants -
- products -
- precipitate -
- combustion -
- synthesis -
- decomposition -
- double displacement -
- single displacement -

Topic: Gas Laws

Days: 10

Subject(s): Science

Grade(s): 10th, 11th, 12th

Key Learning:

Relationships exist between pressure, volume, temperature, and the number of moles of a gas.



Unit Essential Question(s):

What are the primary relationships among volume, temperature, and pressure of a gas?



Concept:

**Gas Laws**3.1.12.B, 3.1.12.D

Concept:

**Kinetic Molecular Theory**3.1.12.B, 3.1.12.A

Concept:

**Application of Gas Laws**3.1.12.D, 3.1.12.B

Lesson Essential Question(s):

What are the relationships between pressure, volume, temperature, and moles of a gas? (A)

What are Boyle's and Charles' Laws? (A)

What is the Ideal Gas Law? (A)

How are molar mass and density related to one another? (A)

How can the Ideal Gas Law be applied to stoichiometry? (ET)

Lesson Essential Question(s):

Why do gases behave the way they do? (A)

How do gases behave differently than liquids and solids? (ET)

Lesson Essential Question(s):

How is Dalton's Law of Partial Pressure used for gas mixtures? (A)

How is Graham's Law used to compare rates of effusion and diffusion for gases? (A)



Vocabulary:

barometer, manometer

Vocabulary:

Vocabulary:

effusion, diffusion, mole fraction

Additional Information:

Attached Document(s):

Vocab Report for Topic: Gas Laws

Subject(s): Science

Days: 10

Grade(s): 10th, 11th, 12th

**Concept:**

Gas Laws

barometer -

manometer -

**Concept: Application of Gas Laws**

effusion -

diffusion -

mole fraction -

Topic: Introduction to Matter

Days: 10

Subject(s): Science

Grade(s): 10th, 11th, 12th

## Key Learning:

The number of protons and the number and location of electrons in an atom determine the properties of an element.



## Unit Essential Question(s):

What is the difference between a chlorine atom and a chloride ion?



## Concept:

**History of Atomic Structure**

3.1.12.C, 3.1.12.B, 3.4.12.A

## Concept:

**Atomic Structure/ Arrangement**

3.4.12.A, 3.1.12.C

## Concept:

**Isotopes and Ions**



## Lesson Essential Question(s):

What are the contributions of Democritus, Dalton, Thomson, Rutherford, and Bohr to atomic theory? (A)

How did technology affect the development of Atomic Theory? (A)

How is the wave model different than the previous models? (A)

## Lesson Essential Question(s):

What is the nucleus? (A)

How are the three types of subatomic particles different from one another? (ET)

What is the location of each subatomic particle? (A)

What is the mass and charge of each subatomic particle? (A)

How is the identity of an atom affected by each subatomic particle? (ET)

## Lesson Essential Question(s):

What is an ion? (A)

What is a cation? (A)

What is an anion? (A)

How are the isotopes of the same element different? (A)



## Vocabulary:

cathode ray, alpha, beta particle, gamma particle

## Vocabulary:

electron cloud, electron, proton, neutron, atomic mass unit (AMU), atomic number, atomic mass number





## Vocabulary:

Topic: Introduction to Matter

Days: 10

Subject(s): Science

Grade(s): 10th, 11th, 12th

<b>Concept:</b> <b>Classification</b> <u>3.1.12.A</u> , <u>3.4.12.A</u>	<b>Concept:</b> <b>Chemical and Physical Changes/ Properties</b> <u>3.4.12.A</u> , <u>3.1.12.C</u>
	
<b>Lesson Essential Question(s):</b> How are pure and impure substances different? (A)  What types of matter are pure? (A)  What types of matter are impure? (A)  What is the difference between an element, mixture, and a compound? (A)	<b>Lesson Essential Question(s):</b> What is the difference between physical and chemical properties/changes? (A)  What are the signs of a chemical change? (A)
	
<b>Vocabulary:</b> matter, heterogeneous, homogeneous, chromatography, distillation, filtration	<b>Vocabulary:</b> intensive, extensive

Additional Information:

Attached Document(s):

Vocab Report for Topic: Introduction to Matter

Days: 10

Subject(s): Science

Grade(s): 10th, 11th, 12th

### Concept:

#### History of Atomic Structure

cathode ray -

alpha -

beta particle - high speed negatively charged particles

gamma particle - high-energy radiation that has no charge

### Concept: Atomic Structure/ Arrangement

electron cloud -

electron - a subatomic particle that has a very low mass and carries a single negative electric charge

proton - a subatomic particle that has a single positive electric charge; mass is about 1840 times that of an electron

neutron - A subatomic particle that bears no net electric charge; mass is slightly greater than that of a proton

atomic mass unit (AMU) - A mass exactly equal to 1/12th the mass of one carbon-12 atom

atomic number - the number of protons in the nucleus of an atom

atomic mass number - sum of the protons and neutrons in an atom

### Concept: Classification

matter - anything that occupies space and possesses mass

heterogeneous - the individual components of a mixture remain physically separated and can be seen as separate components

homogeneous - the composition of the mixture, after sufficient stirring, is the same throughout the solution

chromatography -

distillation -

filtration -

### Concept: Chemical and Physical Changes/Properties

intensive - a property that does not depend on how much matter is being considered

extensive - a property that depends on how much matter is being consumed

Topic: Lab Technique and Safety

Days: 5

Subject(s): Science

Grade(s): 10th, 11th, 12th

Key Learning:

Specific lab techniques are essential to a safe lab environment.



Unit Essential Question(s):

What specific lab techniques are essential to a safe lab environment?



Concept:

**Lab Practices**

3.7.12.B, 3.2.12.B, 3.2.12.C

Concept:

**Lab Safety**

3.7.12.B



Lesson Essential Question(s):

What are correct techniques for handling glassware? (A)

What are the proper procedures for heating and cooling lab equipment and materials? (A)

Lesson Essential Question(s):

Where is the lab safety equipment located? (A)

What are the emergency procedures for the lab? (A)

What is the correct procedure for handling and disposing chemicals? (A)



Vocabulary:

Vocabulary:

Additional Information:

Attached Document(s):



Topic: Measurement  
 Subject(s): Science

Days: 5  
 Grade(s): 10th, 11th, 12th

Key Learning:

Chemistry requires a knowledge of various measurement techniques and data analysis.



Unit Essential Question(s):

Why are precise and accurate measurements important in chemistry?



Concept:

**SI Units of Measurement**

3.1.12.A, 3.1.12.D

Concept:

**Measurement Analysis**

3.1.12.C, 3.2.12.B

Concept:

**Measurement Equipment**

3.7.12.B



Lesson Essential Question(s):

What are the basic units of the SI system? (A)

What are the prefixes and their values? (A)

Lesson Essential Question(s):

How are precision and accuracy different? (A)

How does precision affect significant figures? (A)

How do significant figure rules affect calculations? (A)

How is dimensional analysis used to make unit conversions? (ET)

Lesson Essential Question(s):

What are the basic pieces of equipment used in the chemistry lab? (A)

What degree of precision can be used with each piece of equipment? (A)

What are possible sources of error with each piece of equipment? (ET)



Vocabulary:

Vocabulary:

Vocabulary:

triple beam balance, , flask, graduated cylinder, beaker, pipet, buret, rubber policeman

Additional Information:

Attached Document(s):

Vocab Report for Topic: Measurement

Days: 5

Subject(s): Science

Grade(s): 10th, 11th, 12th

### Concept: Measurement Equipment

triple beam balance -

-

flask -

graduated cylinder -

beaker -

pipet -

buret -

rubber policeman -

Topic: Nomenclature

Days: 20

Subject(s): Science

Grade(s): 10th, 11th, 12th

Key Learning:

Chemical compounds are named using specific rules and a knowledge of this naming system is necessary.



Unit Essential Question(s):

What is the language of Chemistry?



Concept:

**Binary Molecular Compounds**

3.4.12.A, 3.1.12.C

Concept:

**Acids**

3.1.12.C, 3.4.12.A

Concept:

**Ionic Compounds (salts)**

3.1.12.C, 3.4.12.A



Lesson Essential Question(s):

What kinds of elements make up binary molecular compounds? (A)

What are the prefixes and suffixes used in naming binary molecular compounds? (A)

Lesson Essential Question(s):

What is an acid? (A)

What is the difference between binary and oxyacids? (A)

What is the pH of an acid? (A)

Where are acids found in every day life? (ET)

Lesson Essential Question(s):

What type of elements make up ionic compounds? (A)

When do ionic compounds need roman numerals in their name? (A)

What are the names, formulas, and charge of polyatomic ions? (A)



Vocabulary:

Vocabulary:

Vocabulary:

Topic: Nomenclature

Days: 20

Subject(s): Science

Grade(s): 10th, 11th, 12th

Concept:

**Organic**3.4.12.A**Lesson Essential Question(s):**

What is the difference between organic and inorganic compounds? (A)

What are the root prefixes used in organic nomenclature? (A)

What is the difference between alkanes, alkenes, alkynes? (A)

What are some common functional groups and how are they identified? (A)

**Vocabulary:**

ketone, alcohol, aldehyde, carboxylic acid, halogen, aromatic, ether, ester, amines

**Additional Information:****Attached Document(s):**

Vocab Report for Topic: Nomenclature

Days: 20

Subject(s): Science

Grade(s): 10th, 11th, 12th

### Concept: Organic

- ketone -
- alcohol -
- aldehyde -
- carboxylic acid -
- halogen -
- aromatic -
- ether -
- ester -
- amines -

Topic: Periodic Table  
 Subject(s): Science

Days: 10  
 Grade(s): 10th, 11th, 12th

Key Learning:

The periodic table is used to predict properties and relationships of the elements.



Unit Essential Question(s):

How is the periodic table organized?



Concept:

**History and Design**

3.1.12.A, 3.1.12.C, 3.2.12.C

Concept:

**Groups and Periods**

3.1.12.A, 3.1.12.C, 3.4.12.A

Concept:

**Periodic Trends**

3.1.12.A, 3.1.12.C, 3.4.12.A



Lesson Essential Question(s):

Who developed the first periodic table? (A)

How has the periodic table been modified since its development? (ET)

How is the periodic table limited between metals and nonmetals? (A)

Lesson Essential Question(s):

What is the difference between a group and a period? (A)

What are the names of the groups (families)? Where are they located? (A)

What are the distinctive properties of selected families? (A)

Lesson Essential Question(s):

What are the trends related to: electron affinity, ionization energy, atomic radius, electronegativity, and metallic characteristics? (A)

Explain why these trends are this way. (ET)

What is the trend for atomic number and mass? (A)



Vocabulary:  
metalloid

Vocabulary:  
group, period

Vocabulary:

Additional Information:

Attached Document(s):

Vocab Report for Topic: Periodic Table

Days: 10

Subject(s): Science

Grade(s): 10th, 11th, 12th

**Concept:**

History and Design

metalloid -

**Concept: Groups and Periods**

group -

period -

Topic: Quantum Model

Days: 10

Subject(s): Science

Grade(s): 10th, 11th, 12th

Key Learning:

The Quantum Model is an accurate model of atoms in nature.



Unit Essential Question(s):

How is the Quantum Model a more accurate model of atoms in nature compared to the Planetary Model?



Concept:

Nature of Light

Concept:

Photons

Concept:

Quantum Mechanics and Atomic Orbitals



Lesson Essential Question(s):

How does light behave as a wave? (A)

How does light behave as a particle? (A)

What is the relationship between frequency, wavelength, the speed of light, and the electromagnetic spectrum? (ET)

Lesson Essential Question(s):

What is a photon? (A)

How is Planck's constant used to determine the energy of a photon? (A)

How can different forms of matter be identified using emissions of photons? (ET)

Lesson Essential Question(s):

How is Bohr's model relate electron orbits to energy? (A)

What happens when an electron moves from the ground state to an excited state? (A)

How is the Heisenberg Uncertainty Principle related to the quantum model of the atom? (ET)

What are the four quantum numbers and what information do they provide about electrons in an atom? (ET)



Vocabulary:

electromagnetic radiation, wavelength, frequency

Vocabulary:

quantum

Vocabulary:

excited state, ground state, atomic orbital, energy level, Aufbau Principle, Hund's Rule, Pauli Exclusion Principle

Additional Information:

Attached Document(s):

Vocab Report for Topic: Quantum Model

Subject(s): Science

Days: 10

Grade(s): 10th, 11th, 12th

**Concept:**

**Nature of Light**

electromagnetic radiation -  
wavelength -  
frequency -

**Concept: Photons**

quantum -

**Concept: Quantum Mechanics and Atomic Orbitals**

excited state -  
ground state -  
atomic orbital -  
energy level -  
Aufbau Principle -  
Hund's Rule -  
Pauli Exclusion Principle -

Topic: Stoichiometry and Quantitative Chemistry

Days: 20

Subject(s): Science

Grade(s): 10th, 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:

**Mole Concept**

3.1.12.A, 3.1.12.B, 3.1.12.D

Concept:

**Quantitative Analysis from Equations**

3.1.12.A, 3.1.12.B, 3.1.12.D

Concept:

**Empirical Molecular Formulas and % Composition**

3.2.12.C, 3.4.12.A



Lesson Essential Question(s):

What is a mole? (A)

Who developed the mole concept? (A)

Why are moles so important? (ET)

How is the molar mass determined for elements and compounds? (A)

Lesson Essential Question(s):

How does the mole ratio relate the components of a chemical equation? (A)

Why is stoichiometry essential to chemistry? (ET)

What is a limiting reactant and how is it determined? (A)

How is solution stoichiometry different than mass/mass stoichiometry? (ET)

Lesson Essential Question(s):

What is the difference between an empirical and molecular formula? (A)

How is empirical formula determined from percent composition? (A)

What is percent composition of a compound and how is it calculated? (A)



Vocabulary:

atomic mass, Avogadro's number

Vocabulary:

stoichiometry, molarity, molar mass

Vocabulary:

Additional Information:

Attached Document(s):

Vocab Report for Topic: Stoichiometry and Quantitative Chemistry

Subject(s): Science

Days: 20

Grade(s): 10th, 11th, 12th

**Concept:**

Mole Concept

atomic mass -

Avogadro's number -

**Concept: Quantitative Analysis from Equations**

stoichiometry -

molarity -

molar mass -

Topic: Thermochemistry

Days: 10

Subject(s): Science

Grade(s): 10th, 11th, 12th

Key Learning:

Energy transfer is related to chemical reactions.



Unit Essential Question(s):

How is energy transfer related to chemical reactions?



Concept:

1st Law of Thermodynamics

Concept:

Enthalpy



Lesson Essential Question(s):  
What is thermodynamics? (A)

How is the energy transfer between the system and the surroundings determined? (A)

What is the difference between an endothermic and exothermic process? (ET)

Lesson Essential Question(s):  
What is enthalpy? (A)

How can the enthalpy of a reaction be determined using calorimetry, thermodynamic data, or Hess' Law? (ET)

How are coffee cup calorimetry and bomb calorimetry different? (ET)



Vocabulary:

state function, system, surroundings, work, energy, heat

Vocabulary:

enthalpy, calorimeter, calorimetry

Additional Information:

Attached Document(s):

Vocab Report for Topic: Thermochemistry

Days: 10

Subject(s): Science

Grade(s): 10th, 11th, 12th

**Concept:**

1st Law of Thermodynamics

- state function -
- system -
- surroundings -
- work -
- energy -
- heat -

**Concept: Enthalpy**

- enthalpy -
- calorimeter -
- calorimetry -