High School - Chemistry

North Boone CUSD 200

UNITS (9/9 SELECTED)	SUGGESTED DURATION
Unit 1: Physical Properties of Matter	*30 lessons*
Unit 2: Energy and States of Matter Part 1	*25 lessons*
Unit 3: Energy and States of Matter Part 2	*25 lessons*
Unit 4: Describing Substances: Mixtures & Compounds	*14 lessons*
Unit 5: Counting Particles	*13 lessons*
Unit 6: Particles with Internal Structure	*14 lessons*
Unit 7: Chemical Reactions: Particles and Energy	*13 lessons*
Unit 8: Stoichiometry	*13 lessons*
Unit 9: Stoichiometry, Energy, Concentrations, & the Ideal Gas Law	*13 lessons*

Unit 1: Physical Properties of Matter

High School - Chemistry - *Last Updated on June 4, 2019*

STANDARDS

HS-PS1-1.: Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

HS-PS1-7.: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

PRIORITY STANDARDS

HS-PS1-1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
HS-PS1-7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

Unit 1: Physical Properties of Matter

High School - Chemistry - *Last Updated on June 4, 2019*

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. The total amount of energy and matter in closed systems is conserved.	How can we explain the structure, properties, and interactions of matter? How do particles combine to form the variety of matter we observe? How do substances combine or change (react) to make new substances? How do we characterize and explain these reactions and make predictions about them?

Students will know (Knowledge):	Students will be able to (Skills):
• The definitions of mass and volume • And apply the precision parameters of scientific measurement instruments • The law of conservation of system mass • The mathematical relationship among the mass, volume and density of a substance • That density is a characteristic property of matter used to help identify an unknown substance	• Use balances to measure the mass of objects • Represent and interpret trends in data • Convert between units of cubic centimeters and milliliters • Solve quantitative problems using density as a conversion factor between mass and volume • Explain the differences in the structure of solids, liquids, and gases in terms of density

Unit 2: Energy and States of Matter Part 1

High School - Chemistry - *Last Updated on June 4, 2019*

STANDARDS

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

HS-PS3-4.: Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

PRIORITY STANDARDS

HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-PS3-4	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
HS-PS2-8(MA)	Use kinetic molecular theory to compare the strengths of electrostatic forces and the prevalence of interactions that occur between molecules in solids, liquids, and gases. Use the combined gas law to determine changes in pressure, volume, and temperature in gases.

Unit 2: Energy and States of Matter Part 1

High School - Chemistry - *Last Updated on June 4, 2019*

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the number and energy of collisions of molecules and the rearrangements of atoms into new molecules evidenced by temperature, concentration, and rate data and qualitative relationships between rate and temperature. Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. Uncontrolled systems always evolve toward more stable states - that is, toward more uniform energy distribution.	How can we explain the structure, properties, and interactions of matter? How do substances combine or change (react) to make new substances? How do we characterize and explain these reactions and make predictions about them? How is energy transferred and conserved? What is meant by conservation of energy? How is energy transferred between objects or systems?

Students will know (Knowledge)	Students will be able (Skills):

• That historical development of the model of matter studied in this unit
• The bases for the Celsius and Kelvin temperature scales
• The basic tenets of the Kinetic Molecular Theory (KMT) with respect to gases
  ◦ Particles of a gas . . .
  ▪ are in constant motion, moving in straight lines until they collide with another particle or the wall of the container that encloses them
  ▪ experience elastic collisions
  ▪ do not stick to other particles
  ◦ The speed of the particles is related to their temperature
  ◦ The pressure of a gas is related to the frequency and impact of the collisions of the gas particles with the walls of the container that encloses them
	• Observe diffusion in both liquids and gases and explain the process in terms of particle motion and collision
	• Observe addition of energy by warming and explain the results in terms of increased particle motion
	• Explain in terms of particles how a thermometer measures the temperature of a system
	• Predict the effect of changing Pressure, Volume, or Temperature on each of the other variables and explain the effects in terms of collisions of particles
	• Use factors (constants of proportionality) to calculate new Pressure, Volume, or Temperature and determine how a given change affects the unknown variable

Students will know (Knowledge)	Students will be able (Skills):
• How Pressure, Volume, and Temperature are interrelated ◦ Pressure is inversely proportional to Volume ◦ Pressure is proportional to Temperature ◦ Volume is proportional to Temperature	

Unit 3: Energy and States of Matter Part 2

High School - Chemistry - *Last Updated on June 4, 2019*

STANDARDS

HS-PS1-4.: Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

HS-PS1-3.: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS3-4.: Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

PRIORITY STANDARDS

HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
HS-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
HS-PS3-4	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

Unit 3: Energy and States of Matter Part 2

High School - Chemistry - *Last Updated on June 4, 2019*

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
A stable molecule has less energy than its individual atoms alone. Energy must be added in order to take the molecule apart. . Chemical reactions with the resultant breaking and making of new bonds causes a change in overall energy. The melting and boiling points of matter are determined by electrical forces within and between atoms Attraction and repulsion between electric charges at the atomic level explain the structure, properties, and transformations of matter. Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. Uncontrolled systems evolve toward more stable states - that is, toward more uniform energy distribution.	How can we explain the structure, properties, and interactions of matter? How do substances combine or change (react) to make new substances? How do we characterize and explain these reactions and make predictions about them? What is meant by conservation of energy? How is energy transferred between objects or systems?

Students will know (Knowledge):	Students will be able to (Skills):
• How the arrangement of particles changes during phase changes (solid, liquid, gas) • Particle motion associated with each of the three phases and during phase changes • Energy is conserved when a system undergoes change • Energy is stored in an object or system as thermal energy and/or as phase energy • The ways that energy is transferred between a system and its surroundings are by heat (through the collision of particles), work (through macroscopic objects exerting forces on each other), and radiation (emission or absorption of light)	• Draw a model depicting particle motion when energy is added to or lost from a system • Describe the characteristics of solids, liquids, and gases in terms of particle, attraction, repulsion, arrangement • Draw energy bar graphs to account for energy storage and transfer in a variety of changes, including changes in sample situations generated by students • Interpret a substance's heating/cooling curve by identifying the phase(s) present in various sections of the curve; the melting and freezing temperatures for the substance; and which energy storage mode is changing in various sections of the curve

Students will know (Knowledge):	Students will be able to (Skills):
• The meaning of the following terms: heat of fusion *(H_f)*, heat of vaporization *(H_v)*, and heat capacity *(c)*	• Sketch a heating/cooling curve that represents a given situation in which a substance, at a given temperature, undergoes a change in temperature, phase, or both • Use *(H_f)* and *(H_v)* to relate the mass of a substance to the energy absorbed or released during a phase change (ie., at the melting or boiling temperature) • Use *(c)* to relate the mass and temperature changes to the energy absorbed or released during a change in temperature with no phase change

Unit 4: Describing Substances: Mixtures & Compounds

High School - Chemistry - *Last Updated on June 4, 2019*

STANDARDS

HS-PS1-3.: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS1-4.: Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

PRIORITY STANDARDS

HS-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

Unit 4: Describing Substances: Mixtures & Compounds

High School - Chemistry - *Last Updated on June 4, 2019*

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
The properties of a mixture are a blend of the properties of the pure substances that constitute it. Differences in the properties of the pure substances that constitute a mixture allow for the separation of mixtures.	How can we explain the structure of mixtures? How are mixtures separated?

Students will know (Knowledge):	Students will be able to (Skills):
• A pure substance has a definite set of characteristic properties (such as density, melting point, and boiling point) and is composed of one kind of particle • A mixture exhibits properties that are a mixture of the properties of the substances they contain and are composed of more than one kind of particle • Features of Dalton's model of the atom	• Distinguish between pure substances and mixtures • Describe how differences in characteristic properties of the components of a mixture are used to separate those components • Sketch particle diagrams that distinguish compounds, elements, and mixtures • Distinguish elements from compounds in terms of differences in their properties • Cite evidence supporting the belief that some pure substances are 'compounded' of simpler particles in a definite ratio • Cite evidence for Avogadro's Hypothesis • Deduce the formulas of specified compounds using Avogadro's Hypothesis along with evidence from combining volumes • Use composition by mass data to account for the laws of definite and multiple proportions

Unit 5: Counting Particles

High School - Chemistry - *Last Updated on June 4, 2019*

STANDARDS

HS-PS1-7.: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

PRIORITY STANDARDS

HS-PS1-7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

Unit 5: Counting Particles

High School - Chemistry - *Last Updated on June 4, 2019*

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved are necessary precursors for describing and predicting chemical reactions.	How do we count particles that we cannot see? How do we determine the relative mass of particles? How are the mass and the number of particles of a substance related?

Students will know (Knowledge):	Students will be able to (Skills):
• Key concepts and vocabulary associated with counting particles, including: Avogadro's Hypothesis, relative mass, mole, percent composition, empirical formula, molecular formula, and Avogadro's number, • How to search a chemical database to determine the formulas and make models of simple compounds of Hydrogen (H), Carbon (C), Nitrogen (N), and Oxygen (O)	• Correctly use key concepts and vocabulary associated with counting particles in discussions and explanations of problem solving • Use Avogadro's Hypothesis and experimental data to determine the relative mass of molecules • Use experimental data to determine the number of items in a sample without counting them • Use percent composition by mass data to determine the molar mass of elements • Given the mass of a sample substance, determine the number of moles and the number of atoms or molecules in the sample • Given the number of moles of a sample substance, find the mass and the number of atoms or molecules in the sample • Given the formula of a compound, determine its percent composition • Given the percent composition data of a sample, determine the empirical formula of the compound • Given the empirical formula and information about the molar mass of a compound, determine its molecular formula

Unit 6: Particles with Internal Structure

High School - Chemistry - *Last Updated on June 4, 2019*

STANDARDS

HS-PS1-2.: Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS-PS1-3.: Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS2-6.: Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Unit 6: Particles with Internal Structure

High School - Chemistry - *Last Updated on June 4, 2019*

PRIORITY STANDARDS

HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
HS-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
HS-PS1-11(MA)	Design strategies to identify and separate the components of a mixture based on relevant chemical and physical properties.

Unit 6: Particles with Internal Structure

High School - Chemistry - *Last Updated on June 4, 2019*

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
The periodic table orders elements by the number of protons in the atom's nucleus and by similar chemical properties. Repeating patterns in the table reflect patterns of outer electron states. The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. The structure and interactions of matter are determined by electrical forces within and between atoms. Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces.	How can we explain the structure, properties, and interactions of matter? How do particles combine to form the variety of matter we observe? How do substances combine or change (react) to make new substances? How do we characterize and explain these reactions and make predictions about them?

Students will know (Knowledge):	Students will be able to (Skills):
• There is a more complex model of the atom that accounts for the fact that some particles have positive charge whereas others are negatively charged • Properties that distinguish metals from non-metals • Ionic solids have a lattice structure of oppositely charged ions held together by strong electrostatic forces • Melted ionic solids conduct electricity because the charged particles, previously tightly bound in the sold, are free to move about upon melting • Molecular solids are composed of discrete molecules held together by relatively weak dispersion forces or by stronger dipole-dipole forces • The basic structural units of melted molecular solids are electrically neutral and do not conduct electricity	• Cite and describe evidence that supports the idea that particles have a property called charge • Use the Thomson model of the atom to account for neutral atoms becoming either positively or negatively charged by the loss or gain of electrons • Describe the evidence that distinguishes ionic from molecular or atomic solids • When given the formula of an ionic or molecular substance, state its name • When given the name of an ionic or molecular substance, write its formula • When given the name or formula of a substance, determine whether it is ionic or molecular

Students will know (Knowledge):	Students will be able to (Skills):
• The evidence supporting the idea that the mobile charge in atoms is negative • General rules of nomenclature that relate names to the formulas of either ionic or molecular compounds • Rules for distinguishing between a formula unit describing the empirical formula of an ionic sold and a molecular formula describing discrete molecules • Rules for ionic solids forming crystal lattices	

Unit 7: Chemical Reactions: Particles and Energy

High School - Chemistry - *Last Updated on June 4, 2019*

STANDARDS

HS-PS1-2.: Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS-PS1-4.: Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

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

PRIORITY STANDARDS

HS-PS1-2.	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
HS-PS1-4.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
HS-PS1-5.	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-PS1-10(MA)	Use an oxidation-reduction reaction model to predict products of reactions given the reactants, and to communicate the reaction models using a representation that shows electron transfer (redox). Use oxidation numbers to account for how electrons are redistributed in redox processes used in devices that generate electricity or systems that prevent corrosion.* Clarification Statement: • Reactions are limited to simple oxidation-reduction reactions that do not require hydronium or hydroxide ions to balance half-reactions.

Unit 7: Chemical Reactions: Particles and Energy

High School - Chemistry - *Last Updated on June 4, 2019*

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
The periodic table orders elements by the number of protons in the atom's nucleus and by similar chemical properties. Repeating patterns in the table reflect patterns of outer electron states. A stable molecule has less energy than the same set of atoms separated. At least this amount of energy is needed in order to take apart the stable molecule. Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules. When molecules collide, changes in the sum of all bond energies occur that are matched by changes in kinetic energy.	How can we explain the structure, properties, and interaction of matter? How do particle combine to form the variety of matter we observe? How do substance combine or change (react) to make new substances? How do we characterize and explain these actions and make predictions about them?

Students will know (Knowledge):	Students will be able to (Skills):
• Reactions proceed by first breaking bonds between atoms in the reactants and then forming new bonds between these atoms to make the products • The total number of atoms does not change during a reaction because every reactant atom must be included in a product molecule • The total number of particles may change during a reaction because of differences in the bonding ratios of each substance • The distinction between coefficients and subscripts in balanced equations: ◦ Coefficients represent how many particles of each substance are either consumer or formed	• Describe chemical changes in terms of rearranging atoms to form new substances • Describe reactions in terms of macroscopic observations • Describe reactions in terms of microscopic behavior of atoms • Write balanced equations to symbolically represent changes during a reaction • Explain that the coefficients in a chemical equation describe the quantities of individual atoms or molecules involved and the moles of the substances involved • Observe patterns in the way substances react and generalize them as: synthesis, decomposition,

Students will know (Knowledge):	Students will be able to (Skills):
◦ Subscripts represent the count of atoms in a substance • Reactions that produce a decrease in chemical energy (Ech) produce an accompanying increase in thermal energy (Eth) • Exothermic reactions release stored energy to the environment (as heat and/or light). • Endothermic reactions result in a net transfer to energy (from the surroundings) into the arrangement of the atoms in the system	combustion, single replacement, or double replacement (ionic) reactions • Describe endo- and exo-thermic reactions in terms of storage or release of chemical potential energy

Unit 8: Stoichiometry

High School - Chemistry - *Last Updated on June 4, 2019*

STANDARDS

HS-PS1-7.: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

PRIORITY STANDARDS

HS-PS1-7.	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

Unit 8: Stoichiometry

High School - Chemistry - *Last Updated on June 4, 2019*

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Chemical reactions can be described and predicted using the chemical properties of the elements involved and the fact that atoms are conserved in chemical reactions.	How do substances combine or change (react) to make new substances? How do we characterize and explain the reactions and make predictions about them?

Students will know (Knowledge):	Students will be able to (Skills):
• Key concepts and vocabulary associated with stoichiometry, including: ratio reasoning, multi-step problem solving strategies, stoichiometry, stoichiometric mole ratio, theoretical yield, actual yield, percent yield, limiting reactant • Predictions about what happens in chemical reactions can be made if how much stuff (mass) is involved in the reaction to how many particles (moles or particles) are involved in the reaction)	• Correctly use key concepts and vocabulary associated with stoichiometry in discussions, explanations of problem solving, and performance task • Make conversions between measurement units (mole-mass, mole-volume, mass-mole, etc) • Determine the molar mass of a substance and use it to convert between the mass and mole measurements (Unit 5 Review) • Relate coefficients and formulas to a molecular diagram of a reaction (Unit 7 Review) • Given a chemical reaction stated in words, write a balanced chemical equations (Unit 7 Review) • Given a balanced chemical equation, use the number of moles of a reactant consumed or product formed to determine the change in the number of moles of any other reactant or product • Given a balanced chemical equations and the number of **moles** of a reactant or product, determine the number of **moles** of any other reactant or product involved • Given a balanced chemical equation and the **mass** of a reactant or product, determine the **mass** of any other reactant or product involved

Students will know (Knowledge):	Students will be able to (Skills):
	• Given a balanced chemical equation, the **mass** of one reactant, and the **mass** of the product **actually** produced, calculate the **percent yield** for the reaction • Given a balanced chemical equation and the **mass** of the reactants, determine which reactant is **limiting**, why it limits the reaction, and the **theoretical yield** of a product • Distinguish actual from theoretical amounts for a reaction • Given a balanced chemical equation and the amounts of the reactants, sketch molecular diagrams to represent the reaction mixture before and after the reaction

Unit 9: Stoichiometry, Energy, Concentrations, & the Ideal Gas Law

High School - Chemistry - *Last Updated on June 4, 2019*

STANDARDS

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

HS-PS1-7.: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

PRIORITY STANDARDS

HS-PS1-5.	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-PS1-7.	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
HS-PS2-8(MA)	Use kinetic and molecular theory to compare the strengths of electrostatic forces and the prevalence of interactions that occur between molecules in solids, liquids, and gases. Us the combined gas law to determine changes in pressure, volume, and temperature in gases.

Unit 9: Stoichiometry, Energy, Concentrations, & the Ideal Gas Law

High School - Chemistry - *Last Updated on June 4, 2019*

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules. When molecules collide, changes in the sum of all bond energies occur that are matched by changes in kinetic energy. Chemical reactions can be described and predicted using the chemical properties of the elements involved and the fact that atoms are conserved in chemical reactions.	How do substances combine or change (react) to make new substances? How do we characterize and explain these reactions and make predictions about them?

Students will know (Knowledge):	Students will be able to (Skills):
• Key concepts and vocabulary associated with background knowledge that is applied in this unit, including: solutions, relationships between pressure, number of particles, volume, and temperature, standard temperature and pressure (STP) for gasses, energy storage and transfer mechanisms in a molecular system, energy constants (from Units 2, 3, 4, and 6) • Key concepts and vocabulary associated with stoichiometry, energy, concentrations, and the Ideal Gas Law, including: concentration, molarity, partial pressure, molar volume, ideal gas, endo- and exothermic, and enthalpy • Predictions can be made about what happens in chemical reactions if it is possible to convert between the masses of reactants involved in the reaction to the number of particles or moles of particles involved in the reaction	• Correctly use key concepts and vocabulary associated with background knowledge for this unit and with stoichiometry in discussions, inquiry activities, and performance tasks • Determine the partial pressure of a particular gas in a mixture • Experimentally determine the volume of a mole of gas at STP • Use the ideal gas law equation to determine the number of moles in a sample of gas not at standard conditions • Given a balanced equation, the volume, temperature, and pressure of a gaseous reactant or product, predict the moles of another reactant or product • Relate the molar concentration (molarity) of a solution to the number of moles and volume of the solution

Unit 9: Stoichiometry, Energy, Concentrations, & the Ideal Gas Law

High School - Chemistry - *Last Updated on June 4, 2019*

Students will know (Knowledge):	Students will be able to (Skills):
• Volume is a much more convenient measure than mass when reactants are gasses (i.e., not liquids or solids) • The total pressure of a mixture of gases is equal to the sum of the partial pressures of the individual component gases. The partial pressure is the pressure that each gas would exert if it alone occupied the volume of the mixture at the same temperature (Dalton's Law of Partial Pressure) • Molarity measures the concentration of a solution and provides a conversion factor between volume (how much) and moles (how many)	• Given a balanced equation, the volume, and molarity of a reactant or product, predict the moles of another reactant or product in the reaction • Describe endothermic and exothermic reactions in terms of: energy bar graphs and system flow diagrams (LOLOL); balanced equations with a quantitative energy term; and, ΔH notation • Determine stoichiometric relationships in a reaction by extending the use of the Before-Change-After table to cases involving: volume of a gas; volume of a solution; or, energy of reaction