Chemistry (2016)

Wright City R-II
Science
Grades 11 - 12, Duration 1 Year, 1 Credit
Elective Course

Course Description

This course will emphasize the basic concepts of chemistry including scientific method, the atom and periodic table, chemical compounds, nuclear chemistry, moles, stoichiometry, reaction rates, gas laws, equilibrium, acids, bases and salts. Concepts and calculations will be tested, in a lab passed course. Calculator required for the class.

Scope and Sequence

Timeframe	Unit	Instructional Topics
5 Week(s)	Scientific Process and Experimental Design	1. Developing Hypothesis and Graphing Data 2. Lab Safety and Equipment 3. Analyzing data to make predictions 4. Material Composition 5. Phase Changes and Kinetic Molecular Theory 6. Human Impact
6 Week(s)	Perioidic Table Trends	1. Atomic Theory 2. Isotopes and Average Atomic Mass 3. Periodic Table Trends 4. Electron and Orbital Notation 5. Nuclear Decay
6 Week(s)	Chemical Bonding & Reactions	1. Ionic Bonding 2. Covalent Bonding 3. Chemical Reactions
8 Week(s)	Moles and Stoichiometry	1. Moles and Molarity 2. Dilutions 3. Stoichiometry 4. Empirical, Molecular Formula and Percent Composition
4 Week(s)	Gas Laws and Temperature	1. Temperature and Pressure Conversions 2. Boyles Law, Charles, and Guy Lussac Law 3. Combined and Ideal Gas Laws
7 Week(s)	Energy and Acid/Base	1. Specific Heat 2. Activation Energy 3. Enthalpy 4. Entropy and Spontaneity 5. Acids and Bases 6. pH Scale 7. Neutralization Reactions

Prerequisites

Physical Science and Biology

Course Instructional Resources/Textbook

Chemistry, 2013, McGraw-Hill Companies Inc.
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Course Details

UNIT: Scientific Process and Experimental Design -- 5 Week(s)

Unit Description
Students will learn and review the scientific process. This unit will include lab safety and lab equipment identification, developing hypothesis, designing experiments, collecting data, creating graphs, and analyzing data. Students should be able to collect and analyze data to make prediction about impacts on the future. Evaluating evidence and opposing viewpoints will also be emphasized.

Enduring Understandings/Essential Learner Outcomes

Lab Safety
Scientific Process
-Developing Hypothesis
-Making Predictions
-Experimental Design
-Collecting Data
-Analyzing Data and creating graphs
-Drawing Conclusions
Evaluating Systems
Identifying Minerals/Metals/Resources
Identifying Climate factors
Analyzing opposing viewpoints in science
Evaluation Experiment Design

Academic Vocabulary
Experiment Design
Independent Variable
Dependent Variable
Constants
Controls
Hypothesis (Null hypothesis)
Energy and Mineral Resources
Natural System
Minerals
Metals
Conservation
Recycling
Reuse
Precipitation
Temperature
Models
Climates
Evidence Based
Systems
Predict
Biosphere
Hydrosphere
Geosphere

TOPIC: Developing Hypothesis and Graphing Data -- 3 Day(s)

Description
This topic covers how students will create hypothesis for an experiment and graphing data using the independent and dependent variable.

Academic Vocabulary (What terms will students need to know?)
Hypothesis
Null Hypothesis
Independent Variable
Dependent Variable

Learning Targets

I can design a valid experiment to test a hypothesis.
I can analyze lab results including creation of graphs and tables.
I can analyze information to create a hypothesis.

TOPIC: Lab Safety and Equipment -- 2 Day(s)

Description
This topic will cover all lab safety rules and equipment that will be used throughout the year. Students will know all lab safety rules and be able to identify the name and location of all major lab equipment.

Academic Vocabulary (What terms will students need to know?)
Safety Glasses
Fire Blanket
Fire Extinguisher
Beaker
Erlenmeyer Flask
Graduated Cylinder
Bunsen Burner
Ceramic triangle
Evaporating Disc
Test Tube
Test Tube Holder
Gas Bottle
Ring Stand
Iron Ring
Mortal and Pestle
Crucible and Cover
Corks
Wire Gauze
Tongs
Test Tube Holder
Lab Burner
Buret
Pipette
micropipette
dropper
Thermometer
well plate
Spatula
Scoopula
Funnel
File
Wire Brush

Learning Targets

I can identify common lab equipment.

I can follow all lab safety rules.

I can describe the usage of commonly used lab equipment.

TOPIC: Analyzing data to make predictions -- 3 Day(s)

Description
Students will analyze global climate data to make prediction and evaluate the impact on environmental factors.

Academic Vocabulary (What terms will students need to know?)
Analyze
Predict
Climate
Earth System (Environmental factors)

Learning Targets

I can use data about greenhouse gases, global climate, and sea level, and ice volumes to make predictions about future impact.
SC.9-12.ESS3.5

I can analyze geoscientific data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
SC.9-12.ESS3.5

I can compare and evaluate the physical and chemical properties of various substance in a laboratory setting.
SC.9-12.ESS3.6

TOPIC: Material Composition -- 3 Day(s)

Description
Students will be able to identify matter has elements, compounds, heterogeneous or homogeneous mixtures. Students will also develop designs on how to obtain and use various resources. Conservation, Recycling, and Reusing of resources and how it impacts availability.

Academic Vocabulary (What terms will students need to know?)
Conservation
Recycling
Reusing
Element
Compound
Heterogeneous Mixture
Homogeneous Mixture

Learning Targets

I can develop and evaluate solutions to energy and resource problems in the world.
SC.9-12.ESS3.2

I can evaluate the composition of materials and classify as homogeneous or heterogeneous mixture, element, or compound.
SC.9-12.PS1.4

I can evaluate the structure of materials and evaluate the properties that may exists based on the structure.
SC.9-12.PS1.4

TOPIC: Phase Changes and Kinetic Molecular Theory -- 5 Day(s)

Description
This topic deals with naming all phases changes and identifying how the movement of molecules influences phase changes. Students will complete drawings of all phases and describe how molecules changes from one phase to another while naming the phase change.

Academic Vocabulary (What terms will students need to know?)
Solid
Liquid
Gas
Evaporation
Condensation
Freezing
Melting
Sublimation
Desublimation

Learning Targets

I can compare and evaluate the physical and chemical properties of various substance in a laboratory setting.
SC.9-12.PS1.3

I can use the Kinetic Molecular Theory to describe how changes in the motion of particles effects the states of matter of a substance.
SC.9-12.PS3.2

I can use the kinetic molecular theory to analyze how temperature change affects properties of materials.
SC.9-12.PS1.6

TOPIC: Human Impact -- 3 Day(s)

Description
This topic will cover how human impact can affect Earth systems. This will include data of production of greenhouse gases and how it can affect biosphere, hydrosphere, etc. Will include reference to phase changes and composition of matter as element, compound, heterogeneous or homogeneous mixture. Cumulative Activity for unit.

Academic Vocabulary (What terms will students need to know?)
Experiment Design
Independent Variable
Dependent Variable
Constants
Controls
Hypothesis (Null hypothesis)
Energy and Mineral Resources
Natural System
Minerals
Metals
Conservation
Recycling
Reuse
Precipitation
Temperature
Models
Climates
Evidence Based
Systems
Predict
Biosphere
Hydrosphere
Geosphere

Learning Targets

I can use models to describe how the open energy system of the earth affects climate.
SC.9-12.ESS2.4

I can analyze the global challenge of climate change using qualitative and quantitative information and constraints to develop solutions for humans.
SC.9-12.ETS.1

I can evaluate the trade offs and priorities to analyze the global issue of climate change.
SC.9-12.ETS3.3

UNIT: Perioidic Table Trends -- 6 Week(s)

Unit Description
In this unit the periodic table will be the main focus. First students will learn to properly read the table to identify protons, electrons, neutrons and mass of an element. Next students will cover how isotopes differ from one another and how to calculate atomic mass given isotope mass and percent abundance. Students will also recognize trends of electronegativity, atomic radius, and ionization energy from the periodic table. Electron notation including Bohr models, electron notation, and orbital notation will be covered. The unit will end with nuclear decay including, alpha, beta, positron, and gamma decay.

Enduring Understandings/Essential Learner Outcomes
Students should be able to use the periodic table to identify the atomic mass, atomic number, protons, electrons, and neutrons found in any element.
Students will be able to identify differences in isotopes and how that influences the structure of the atom.
Students should be able to use the periodic table to compare electronegativity, atomic radius, and ionization energy of different elements.
Students will be able to create Bohr models, electron notation, and orbital notation for any element on the periodic table.
Students will be able to identify types of nuclear decay and what products are created from each type.

Academic Vocabulary
Periodic Table
Proton
Neutron
Electron
Nucleus
Isotope
Atomic Mass
Atomic Number
Percent Abundance
Isotope Notation
Electronegatvity
Ionization Energy
Atomic Radius
Bohr model
Electron Notation
Orbital Notation
Valence Electrons
Nuclear Decay
Alpha Decay
Beta Decay
Positron emission
Gamma Decay

TOPIC: Atomic Theory -- 4 Day(s)

Description
During this topic we will cover the discovery of the subatomic particles found in the atom and creation of the atomic theory. Discovery of atom, nucleus, proton, electron, electron cloud, and neutron will be covered. Students will also review reading the periodic table to identify atomic number and mass to determine proton, electron, and neutron composition of the element.

Academic Vocabulary (What terms will students need to know?)
Atomic Theory
Subatomic Particle
Proton
Electron
Neutron
Electron Cloud
Nucleus
Atomic Number
Atomic Mass
Element

Learning Targets

I can determine the proton, electron, and neutron number in elements based on the subatomic particles found in it or use the periodic table to determine the proton, electron, and neutron number.
SC.9-12.PS1.1

I can create and use a model to display the subatomic particles of any element.
SC.9-12.PS1.1

TOPIC: Isotopes and Average Atomic Mass -- 4 Day(s)

Description
In this topic students will identify that isotopes are atoms of the same element with different masses due to changes in the number of neutrons. They will also be able to calculate average atomic mass using percent abundance and mass of isotopes.

Academic Vocabulary (What terms will students need to know?)
Isotope
Neutrons
Average Atomic Mass
Percent Abundance
Isotope notation

Learning Targets

I can identify the changes in a nuclear composition of isotopes.

SC.9-12.PS1.9

I can use isotopes to determine changes that have occurred to an element and determine the average atomic mass.

SC.9-12.PS1.9

TOPIC: Periodic Table Trends -- 4 Day(s)

Description
In this topic students will recognize trends in the organization of the periodic table. They will be able to name each group on the periodic table and classify elements into a group. Students will be expected to know key properties of each group. The topic will also cover trends of atomic radius, electronegativity and ionization energy on the periodic table.

Academic Vocabulary (What terms will students need to know?)
Groups
Alkali Metals
Alkali Earth Metals
Noble Gases
Halogens
Metalloids
Metals
Nonmetals
Atomic Radius
Electronegativity
Ionization Energy

Learning Targets

I can use the periodic table to evaluate the composition, properties, and reactivity of elements.

SC.9-12.PS1.1

Students will evaluate properties of elements and compounds based on electron structure.

SC.9-12.PS1.3

TOPIC: Electron and Orbital Notation -- 4 Day(s)

Description
For this topic students will use the number of electrons found in an element on the periodic table to create electron, orbital, or noble gas notation for that element. They will also be able to read the notation and identify the element. Students should be able to identify the number of valence electrons as well.

Academic Vocabulary (What terms will students need to know?)
Valence Electron
Electron Notation
Orbital Notation
Noble Gas Notation

Learning Targets

I can use the periodic table to determine the electron structure of an element.
SC.9-12.PS1.1

I can show that nuclear reactions retain the number of neutrons plus protons but not atoms.
SC.9-12.PS1.2

TOPIC: Nuclear Decay -- 4 Day(s)

Description
This topic covers nuclear reactions including fusion, fission, alpha, beta, gamma decay, and positron emission.

Academic Vocabulary (What terms will students need to know?)
Nuclear
Fission
Fusion
Alpha Decay
Alpha Particle
Beta Decay
Beta Particle
Gamma Decay
Positron Emission
Nuclear Energy

Learning Targets

I can use models to represent nuclear decay including usage of energy.
SC.9-12.PS1.9

I can evaluate and analysis the energy involved in nuclear processes including fission, fusion, and decay.
SC.9-12.PS1.9

I can show that nuclear reactions retain the number of neutrons plus protons but not atoms.
SC.9-12.PS1.9

UNIT: Chemical Bonding & Reactions -- 6 Week(s)

Unit Description
This unit will look at how atoms bond together to form compounds and how elements and compounds react. Chemical bonding will include how ionic and covalent bonds are formed, naming the compounds created, and the 3-D structure formed. Chemical reactions will include: naming reaction types, predicting products, and balance chemical equations.

Enduring Understandings/Essential Learner Outcomes
Formation of Ions
Octet Rule
Formation of Ionic Bonds
Naming Ionic Bonds
Formation of Covalent Bonds (electron sharing)
Naming Covalent Bonds
Identifying 3-dimensional shapes of covalent compounds

Writing Chemical Reactions
Identifying Chemical Reactions type
Using reaction types to predict products
Balancing chemical reactions

Academic Vocabulary
Ion
Bond
Ionic Bond
Covalent Bond
tetrahedral
trigonal planar
trigonal pyramidal
bent/angled
linear
Sinlge Replacement
Double Replacement
Combustion
Synthesis
Decomposition

TOPIC: Ionic Bonding -- 6 Day(s)

Description
For this topic students will learn first what an ion is, then how ions bond together to form ionic bonds. They will also learn how to properly name ionic bonds and write the chemical formula for ionic compounds.

Academic Vocabulary (What terms will students need to know?)
Ions
Ionic Bond
Valence Electrons
Periodic Trends
Lewis Dot Structures
Reactants
Products

Learning Targets

I can predict the products of a chemical reaction.
SC.9-12.PS1.2

I can evaluate how ions will bound to form ionic bonds and write the correct chemical formula.
SC.9-12.PS1.2

I can identify how ionic bonds are formed and what impact that has on the properties of the compound.
SC.9-12.PS1.4

TOPIC: Covalent Bonding -- 6 Day(s)

Description
For this topic students will show how electrons are shared in covalent bonds and how to properly name covalent bonds. They then will work with the 3-d shape of molecules by building the molecular and name the shape and whether it is polar or nonpolar.

Academic Vocabulary (What terms will students need to know?)
Covalent Bonds
Octet Rule
Tetrahedral
Trigonal Planar
Bent
Trigonal Pyramidal
Nonmetal
Diatomic
polar
nonploar

Learning Targets

I can predict the products of a chemical reaction.
SC.9-12.PS1.2

I can analyze how different chemical bonds give molecules shape and properties.
SC.9-12.PS1.4

I can evaluate what elements will bond covalently and show the reaction for their bonding.
SC.9-12.PS1.2

I can use electron structure to analyze how elements will bond to form compounds.
SC.9-12.PS1.2

TOPIC: Chemical Reactions -- 10 Day(s)

Description
For this topic students will be working with chemical reactions. First they will learn how to properly write and identify reaction types. Then using the reaction types they will learn how to predict products formed from a reactant. Finally they will work with balancing chemical equations.

Academic Vocabulary (What terms will students need to know?)
Reactants
Products
Single Replacement
Double Replacement
Combustion
Synthesis
Decomposition
Coefficents
Subscripts
Moles

Learning Targets

I can write and balance chemical equations/reactions.
SC.9-12.PS1.8

I can predict the products of a chemical reaction.
SC.9-12.PS1.2

I can create a balanced equation to model the conservation of matter in chemical reactions.
SC.9-12.PS1.8

UNIT: Moles and Stoichiometry -- 8 Week(s)

Unit Description
For this unit students will learn the concept of the mole and molarity. They will then use molarity to work with dilutions and moles to work with stoichiometry of reactions. The unit will also cover percent composition and empirical formula.

Enduring Understandings/Essential Learner Outcomes
Determine number of atoms in a given amount of substance
Determine number of moles in a given amount of substance
Determine mass when given number of moles
Calculate the molarity of a solution
Calculate the dilution of a solution
Explain the affect of dilution on a reaction rate
Use dimensional analysis to complete stoichiometry of reactions. (gram to mole, mole to mole, gram to gram)
Calculate the percent composition of a compound
Calculate the empirical formula of a compound.

Academic Vocabulary
Mole
Avogaddo's Number
Molarity
Concentration
Dilution
Mole ratio
Percent Composition
Empirical Formula
Molecular Formula

TOPIC: Moles and Molarity -- 2 Week(s)

Description
For this topic first students will learn what a mole is, then how to convert between atoms, grams and moles. Once students have the concept of the mole figured out then they will begin working with molarity and determining molarity and molality of solutions.

Academic Vocabulary (What terms will students need to know?)
Mole
Avogaddo's Number
Molarity
Molality
Concentration

Learning Targets

I can determine how concentration/number of atoms affect molarity.
SC.9-12.PS1.6

I can determine how changes in volume or particles affect molarity and reactivity.
SC.9-12.PS1.6

I can use the moles concept to determine the number of atoms of a compound/element present.
SC.9-12.PS1.8

TOPIC: Dilutions -- 4 Day(s)

Description
For this topic students will work with evaluating how dilutions influence the reactivity and properties of solutions. They will also calculate how to create a solution of a given molarity when given a concentrated solution. Students will be able to calculate and describe the difference between molarity and molality.

Academic Vocabulary (What terms will students need to know?)
Molarity
Molality
Concentration
Dilution

Learning Targets

I can use the masses and percent composition to determine the molecular formula of an unknown compound through lab
SC.9-12.PS1.6

TOPIC: Stoichiometry -- 3 Week(s)

Description
For this topic students will work with stoichiometry. Students should use the concept of conservation of matter to complete stoichoimetric problems. Students will have to balance chemical equations, convert grams to moles, use a mole to mole ratio, and convert moles to grams.

Academic Vocabulary (What terms will students need to know?)
Stoichiometry
Mole Ratio
Conservation of matter/mass
Percent Yield

Learning Targets

I can write and balance chemical equations/reactions.
SC.9-12.PS1.8

I can use stoichiometry to calculate the theoretical yield of a chemical reaction.
SC.9-12.PS1.8

I can use stiochiometry to evaluate limiting reactants for a chemical reaction and calculate how much of a reactant is needed.
SC.9-12.PS1.6

I can change use concentration of compounds to change the product yield of a chemical reaction.
SC.9-12.PS1.6

TOPIC: Temperature and Pressure Conversions -- 3 Day(s)

Description
For this topic students will convert between the Fahrenheit, Celsius, Kelvin, and Ranken temperature scales. Students will also review how changes in temperature affect the movement of particles. Students will also convert between pascals, kilopascals,

Academic Vocabulary (What terms will students need to know?)
Fahrenheit
Celsius
Kelvin
Ranken
Pascal

Learning Targets

I can determine the empirical and molecular formula of a compound theoretically and experimentally.
SC.9-12.PS1.3

I can use percent composition to calculate the empirical and molecular formula of a compound.
SC.9-12.PS1.8

I can use the masses and percent composition to determine the molecular formula of an unknown compound through lab procedures and calculations.
SC.9-12.PS1.8

UNIT: Gas Laws and Temperature -- 4 Week(s)

Unit Description
In this unit temperature and pressure units and conversions will be covered. Then students will work with the gas laws and particle movement to determine changes in pressure, temperature, volume, and moles of a gas.

Enduring Understandings/Essential Learner Outcomes
Use of temperature scales
Convert between temperature scales
Use of pressure units
Convert between pressure scales
Use Boyle's Law to determine and calculate changes in gases
Use Charles Law to determine and calculate changes in gases
Use Gay Lussac's Law to determine and calculate changes in gases
Use the Combined Gas Law to determine and calculate changes in gases
Use the Ideal Gas Law to determine and calculate changes in gases

Academic Vocabulary
Celsius
Kelvin
Ranken
Fahrenheit
Pascals
Bar
mmHg
atmospheres
Boyle's Law
Charles Law
Guy Lussac Law
Combined Gas Law
Ideal Gas Law
Ideal Gas Constant

TOPIC: Temperature and Pressure Conversions -- 3 Day(s)

Description
For this topic students will convert between the Fahrenheit, Celsius, Kelvin, and Ranken temperature scales. Students will also review how changes in temperature affect the movement of particles. Students will also convert between pascals, kilopascals, atm, mm Hg, and bar in the pressure scales.

Academic Vocabulary (What terms will students need to know?)
Fahrenheit
Celsius
Kelvin
Ranken
Pascal
kilopascal
atmopsheres
mm Hg
bar
Temperature
Heat
Pressure

Learning Targets

I can explain and show how thermal energy is transferred between molecules/objects.
SC.9-12.PS3.4

I can evaluate how changes in temperature affect particle movement and reaction rates.
SC.9-12.PS1.6

TOPIC: Boyles Law, Charles, and Guy Lussac Law -- 5 Day(s)

Description
For this topic students will work with the three two-variable gas laws and determine the effect changing one factor has on another. This will include both theoretical and calculations on the impact of the changes.

Academic Vocabulary (What terms will students need to know?)
Boyle's Law
Charles' Law
Guy Lussac's Law
Temperature
Pressure
Volume

Learning Targets

I can explain how changing temperature, pressure, or volume will effect the behavior of substances.
SC.9-12.PS1.6

I can can evaluate a system design and make changes to affect pressure, temperature, or volume.
SC.9-12.PS1.7

TOPIC: Combined and Ideal Gas Laws -- 6 Day(s)

Description
For this topic students will work with the combined and Ideal Gas Law. These gas laws use more than two variables in the changes in gases.

Academic Vocabulary (What terms will students need to know?)
Combined Gas Law
Ideal Gas Law
Ideal Gas Law Constant

Learning Targets

I can use the combined gas law and ideal gas law to investigate how changing pressure, temperature, volume or concentration affects the others.
SC.9-12.PS1.3

I can calculate the changes in volume, temperature, volume, and concentration and determine how it will affect the properties of the compound.
SC.9-12.PS1.3

I can evaluate a system with gases and evaluate how changing factors would affect the pressure, temperature, volume, or number of particles present.
SC.9-12.PS1.7

UNIT: Energy and Acid/Base -- 7 Week(s)

Unit Description
This unit will cover the Activation Energy, Entropy, and Ethalpy of a reaction. This will include working with Hess' Law and Gibbs Free Energy and how they affect the spontaneity of a reaction. It will also cover Acid and Bases are and how they react with one another. This will include a study of the pH scale, reactivity and neutralization.

Enduring Understandings/Essential Learner Outcomes
Determining heat versus temperature.
Determining effect of activation energy on progress of reaction.
Determining effect of a catalyst or inhibitor on activation energy.
Calculating change in energy of a reaction.
Comparing Ethalpy and Entropy of a reaction
Estimating and Calculating the entropy of a reaction.
Using Hess' Law and Gibbs free energy to determine spontaneity of a reaction
Comparing types of Acids and Bases
Evaluating compounds as Acids or Bases
Calculating pH and pOH
Predicting products of neutralization reactions
Calculating changes in pH from neutralization reactions

Academic Vocabulary
Heat
Energy
Joules
Activation Energy
Catalyst
Inhibitor
Equilibrium
Entropy
Enthalpy
Hess' Law
Gibb's Free Energy
Spontaneous Reaction
Nonspontaneous Reaction
Free Energy
Acid (Lewis, Bronstead-Lowry, Arrenhius)

Base (Lewis, Bronstead-Lowry, Arrenhius)
pH
pOH
hydrogen ions
hydroxide ions
neutralization

TOPIC: Specific Heat -- 3 Day(s)

Description
For this topic students will work with the concept of specific heat. Study will include how specific heat influences the change of heat and energy in the object. Students will study the transfer of thermal energy between objects in a closed system.

Academic Vocabulary (What terms will students need to know?)
Specific Heat
Calorimeter
Calorie
Thermal energy
Closed system

Learning Targets

I can design and conduct an experiment on the transfer of thermal energy within a closed system and predict the resulting change in temperature.
SC.9-12.PS3.4

I can create and use a calorimeter to calculate the specific heat of a substance.
SC.9-12.PS3.4

TOPIC: Activation Energy -- 4 Day(s)

Description
For this topic students will learn what Activation Energy is, create graphs of the energy of a reaction, and show how catalyst and inhibitors will influence the reaction.

Academic Vocabulary (What terms will students need to know?)
Activation Energy
Enthalpy
Catalyst
Inhibitor

Learning Targets

I can evaluate and calculate the changes in bond energy within a chemical reaction based on individual bond energies.
SC.9-12.PS1.5

I can create models showing changes in free energy for chemical reactions including activiation energy graphs for endothermic and exothermic reactions.
SC.9-12.PS1.5

I can use models to display how catalyst and inhibitors affect chemical reaction rates and energy.
SC.9-12.PS1.5 SC.9-12.PS1.7

TOPIC: Enthalpy -- 5 Day(s)

Description
For this topic students will work with the change in energy from a reaction or enthalpy. Students will calculate changes in energy from a reaction by evaluating bond strengths.

Academic Vocabulary (What terms will students need to know?)
Enthalpy
Bond energy
Covlanet Bonds
Ionic Bonds
Dipoles
London Dispersion Forces

Learning Targets

I can create a model to show the changes in energy in chemical reaction from reactants to products.
SC.9-12.PS1.5

I can calculate the changes in energy of a chemical reaction given the bond stregnth of the bonds found in the compounds of reactants and products.
SC.9-12.PS1.5

I can analysis the energy absorbed or released by a chemical reaction and use the conservation of energy within a closed system.
SC.9-12.PS1.5

TOPIC: Entropy and Spontaneity -- 3 Day(s)

Description
For this topic students will work with entropy or order of a reaction. The topic will cover both theoretical and mathematical calculations of spontaneity of a reaction using Gibb's Free Energy. Using enthalpy and entropy students should be able to predict the spontaneity of a reaction.

Academic Vocabulary (What terms will students need to know?)
Entropy
Order
Gibbs Free Energy
Hess' Law
Spontaneous
Nonspontaneous

Learning Targets

I can create a computational model to calculate the changes in energy during a chemical reaction.
SC.9-12.PS3.1

I can calculate the free energy using entropy and ethalpy of a reaction.
SC.9-12.PS3.1

I can create a system or model to determine if a reaction is spontaneous and nonspontaneous.
SC.9-12.PS3.1

TOPIC: Acids and Bases -- 3 Day(s)

Description
Students will work the three definitions for acids and bases: Arrenhuis, Bronstead-Lowry, and Lewis.

Academic Vocabulary (What terms will students need to know?)
Lewis Acid
Lewis Base
Bronstead-Lowry Acid
Bronstead-Lowry Base
Arrenhuis Acid
Arrenhuis Base
Acid
Base
Hydrogen ion
Hydroxide ion
Dissassociation

Learning Targets

I can predict and show the disassociation reactions for an acid or base.
SC.9-12.PS1.2

I can determine properties of an acid or base based on the molecular structure.
SC.9-12.PS1.4

TOPIC: pH Scale -- 4 Day(s)

Description
This topic will familiarize students with the pH scale, pOH, and concentration of acids and bases. The topic will look at stregnths of acids and bases and calculating pH and pOH.

Academic Vocabulary (What terms will students need to know?)
pH scale
pH
pOH
hydrogen ion
hydroxide ion

Learning Targets

I can describe how differences in chemical composition affect the pH of a compound.
SC.9-12.PS1.3

I can design and analysis test to determine the strength of an acid or base.
SC.9-12.PS1.3

TOPIC: Neutralization Reactions -- 4 Day(s)

Description
For this topic students will work with neutralization reactions and titrations. Students will be expected to predict products of neutralization reactions and calculate the change in pH and concentration of compounds.

Academic Vocabulary (What terms will students need to know?)
Acid
Base
Neutralization
Titration
Concentration
pH
pOH

Learning Targets

I can use titrations experimentally and theoretically to determine unknown molarities.
SC.9-12.PS1.7

I can use pH values to determine the amount of acid or base needed to neutralize a compound.
SC.9-12.PS1.7