Chemistry

Grade 10

Prepared by:

DEBORAH MARKS

Superintendent of Schools:

Marie C. Cirasella, Ed.D.

Approved by the Midland Park Board of Education on

June 21, 2022

Born on **Date June 20, 2022**

Chemistry

Course Description:

High School Chemistry is taught in five units throughout the school year. The curriculum is a hands-on, open-ended and sequential process of investigating the composition of matter and the physical and chemical changes it undergoes. High School Chemistry is a laboratory science course in which students investigate the composition of matter and the physical and chemical changes it undergoes. Students use science process skills to study the fundamental structure of atoms, the way atoms combine to form compounds, and the interactions between matter and energy. Students will investigate chemical bonding and how the kinetic molecular theory and intermolecular forces explain the physical and chemical characteristics of matter. Additional aspects of chemical reactions including limiting reactants, percent yield, equilibrium, reaction rates, and thermochemistry are considered. Aspects of physical science; life science; earth & space science; and engineering, technology & applications of science are taught throughout the year. A guided inquiry program gives students the opportunity to explore topics and concepts through investigations. Participating in this hands-on program helps students:

1. To foster a life-long enjoyment of learning science.
2. To observe science in the world around them.
3. To meet the science standards for New Jersey Public Schools

Course Sequence:

Unit 1: Structure and Properties of Matter: 45 days
Unit 2: The Chemistry of Abiotic Systems: 25 days
Unit 3: Bonding and Chemical Reactions: 45 days
Unit 4: Ionic and Covalent Compounds; Acids and Bases: 40
Unit 5: Nuclear Chemistry: 25 days

Prerequisite: Biology, Algebra I

**The number of instructional days is an estimate based on the information available at this time. 1 day equals approximately 48 minutes of seat time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.*

Unit # - 1

Overview

Content Area: Chemistry

Unit Title: Structure and Properties of Matter

Grade Level: 10

Core Ideas: In this unit of study, students use investigations, simulations, and models to make sense of the substructure of atoms and to provide more mechanistic explanations of the properties of substances. Chemical reactions, including rates of reactions and energy changes, can be understood by students at this level in terms of the collisions of molecules and the rearrangements of atoms. Students are able to use the periodic table as a tool to explain and predict the properties of elements. Students are expected to communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. The crosscutting concepts of structure and function, patterns, energy and matter, and stability and change are called out as the framework for understanding the disciplinary core ideas. Students use developing and using models, planning and conducting investigations, using mathematical thinking, and constructing explanations and designing solutions. Students are also expected to use the science and engineering practices to demonstrate proficiency with the core ideas.

Standards (Content and Technology)

CPI#: Statement:

Performance Expectations (NJSLS)

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-PS1-2 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

Career Readiness, Life Literacies, and Key Skills

9.1.12.EG.3 Explain how individuals and businesses influence government policies.

9.1.12.FP.3	Relate the concept of delayed gratification (i.e., psychological distance) to meeting financial goals, investing and building wealth over time.
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.4.12.CI.2:	Identify career pathways that highlight personal talents, skills and abilities
9.4.12.CT.2:	Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
Computer Science and Design Thinking	
8.1.12.IC.1	Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.IC.2	Test and refine computational artifacts to reduce bias and equity deficits.

8.1.12.IC.3	Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies have had on innovation and on a society's economy, politics, and culture.
8.2.12.ETW.4	Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.
Interdisciplinary Connection	
NJSLS.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
Companion Standards ELA/L	
NJSLSA.R1.	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

NJSLSA.R2.	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
NJSLSA.R4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
Cross-cultural Statements/Mandates (Amistad, Holocaust, LGBT, etc...)	
Reflect on the influence that Hispanic Americans; Blind, Deaf & Hard of Hearing Americans; members of the AAPI, the LGBTQ and handicapped community has had on our knowledge and understanding of matter.	
Recognize the importance of self-confidence in handling daily tasks and challenges (CASEL)	
Develop, implement and model effective problem solving and critical thinking skills (CASEL)	
7.1.AL.IPRET.1	Identify main ideas and significant details in a range of oral, viewed, and written texts.
7.1.AL.IPRET.9	Differentiate facts from opinions by accurately answering most questions that require inferring implied meanings.

Unit Essential Question(s):

- How can a periodic table tell me about the subatomic structure of a substance?
- How can I use the periodic table to predict if I need to duck before mixing two elements?
- How can I use the properties of something (in bulk quantities) to predict what is happening with subatomic particles?
- I want to do the right thing, what is the greener choice for grocery bags (paper or plastic/reusable vs. disposable); cold drink containers (plastic, glass, or aluminum); or hot drink containers (paper, Styrofoam, or ceramic)? How does a materials chemical make up relate to this dilemma?
- How is matter classified?
- What is the difference between an element, compound, and mixture?
- What is the nature of matter, its classifications, and its system for naming types of matter.

Unit Enduring Understandings:

- Different patterns may be observed at each of the scales at which a system is studied, and these patterns can provide evidence for causality in explanations of phenomena.
- Each atom has a charged substructure.
- An atom's nucleus is made of protons and neutrons and is surrounded by electrons.
- The periodic table orders elements horizontally by the number of protons in the nucleus of each element's atoms and places elements with similar chemical properties in columns.
- The repeating patterns of this table reflect patterns of outer electron states.
- Patterns of electrons in the outermost energy level of atoms can provide evidence for the relative properties of elements at different scales.
- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.
- 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 at the bulk scale are determined by electrical forces within and between atoms.
- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, aesthetics, and to consider social, cultural,

and environmental impacts.

- Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.
- Models (e.g., physical, mathematical, computer models) can be used to simulate why the molecular-level structure is important in the functioning of designed materials.

Evidence of Learning

Formative Assessments:

- Conferences
- Observations
- Question and Answer Sessions
- First Drafts / Quizzes
- Journals

Summative/Benchmark Assessment(s):

- Chapter/Unit tests
- Projects
- Performances
- Final copies

Alternative Assessment(s):

- Extended Projects
- Lab work
- Journaling

Resources/Materials:

Buthelezi, Thandi, Laurel Dingrando, Nicholas Hainen, Cheryl Wistrom, and Dinah Zike. *Glencoe Chemistry: Matter and Change*. Bothell, WA: McGraw-Hill Education, 2013. Print.

Key Vocabulary:

atom

chemical property/change
density

mass

physical property/change
substance
valence electron
filtration
distillation
crystallization

	chromatography	
	Suggested Pacing Guide	
Lesson Name/Topic	**Student Learning Objective(s) Suggested Tasks/Activities:**	**Day(s) to Complete**
Matter in General	Contrast physical and chemical properties for substances, Contrast between physical and chemical changes for substances Categorize substances based on their properties Solve for the density of various objects by measuring their mass and volume and predict the type of matter for these objects through comparison to known densities	3 Concept Mapping Element, Mixture Compound Kahoot Density (PhET)
Atomic Scale of Structure of Matter	Use a variety of models to understand the structure of an atom	3 Drawing Models of Atoms
Valence Electrons	Write electron configurations for main group elements, paying attention to patterns of electrons in the outermost energy level	2 Writing Electron Configuration Examples Build an Atom (PhET)
Power of the Periodic Table	Annotate the periodic table to determine its arrangement horizontally by number of protons in the atom's nucleus and its vertical arrangement by the placement of elements with similar chemical properties in columns	3 Periodic Table Scavenger Hunt Rutherford Scattering (PhET)
Translation of the Periodic Table	Translate information about patterns in the periodic table into words that describe the importance of the outermost electrons in	2 Comparing Metals, Nonmetals, metalloids Periodic Table COncept Builder

	atoms	(physicsclassroom.com)	
Chemical Reactions	Observe simple reactions in a closed system and measure the mass before and after the reaction as well as count atoms in reactants and products in chemical formulas	Chemical Reaction Lab Demo	4
Law of Conservation of Mass	Construct chemical formulas involving main group elements in order to model that atoms are conserved in chemical reactions (the Law of Conservation of Mass)	Reactants, Products and Leftovers (PhET)	3
Types of Chemical Reactions	Describe and predict simple chemical reactions, including combustion, involving main group elements. Students should use units when modeling the outcome of chemical reactions	Types of Reactions (physicsclassroom.com)	3
Writing Chemical Reactions	Write a rigorous explanation of the outcome of simple chemical reactions	Written Quiz	2
Investigating Properties	Investigate melting point, boiling point, vapor pressure, and surface tension	Melting Point GIZMO	2
Forces between particles	Investigate how the strength of forces between particles is dependent on particle type (ions, atoms, molecules, networked materials [allotropes])	Khan Academy lesson group	2
Types of Solids	Examine crystal structures and amorphous structures	wisc-online unit (types of solids)	1
Heating and Cooling Curves	Collect data to create cooling and heating curves. Analyze the results to determine the patterns	ChemActivity: Phase Changes and Intermolecular Forces (PhET)	3
Form and Function at	Communicate scientific and technical information about why the	Lab Journaling, Poster claim-evidence	3

	molecular-level structure is important in	

Molecular Level	the functioning of designed materials, the focus should be on attractive and repulsive forces.	
Real World Applications	Consider the properties of various materials (e.g. Molar mass, solubility, and bonding) to decide what materials to use for what purposes, inputs and outputs measured for their real-world problem. Students must consider the properties of various materials (e.g. Molar mass, solubility, bonding) to decide which materials to use for which purposes Research - Inquiry based exploration of student written problem	5
Environmental Impact	Evaluate the Life Cycle Analysis, LCA, process and communicate a solution to a real-world problem, such as the environmental impact of different types of grocery bags (paper or plastic/reusable vs. disposable), cold drink containers (plastic, glass, or aluminum), or hot drink containers (paper, Styrofoam, or ceramic). Research - Inquiry based exploration of student written problem	4

Teacher Notes:

Additional Resources:

Build an Atom: This simulation allows students to create different illustrations of atoms and provides evidence that protons determine the identity of the element.

Periodic Table Trends: This is a virtual investigation of the periodic trends.

Castle of Mendeleev: Students engage in a fantasy world that requires them to make claims, based on evidence, regarding the identity of unknown materials.

Shall We Dance? – Classifying Types of Chemical Reactions: Students identify and differentiate between four types of chemical reactions: synthesis, decomposition, single replacement and double replacement. Students also develop models for chemical reactions and identify the limitations of the models using evidence.

Click links below to access additional resources used to design this unit:
https://phet.colorado.edu/en/simulations/category/chemistry
http://www.rsc.org/resources-tools/education-resources/

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504Students

● Consult student IEP ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation	● Consult ELL student Plan ● Assign a buddy, same language or English speaking ● Allow errors in speaking ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions	● Consult G and T teacher ● Provide extension activities ● Build on students' intrinsic motivations ● Higher Level mathematical computations	● Consult with IR&S as needed ● Provide extended time to complete tasks ● Consult with Guidance	● Consult 504 Plan ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation

Midland Park Public Schools

Unit # - 2	
Overview	
Content Area: Chemistry	
Unit Title: The Chemistry of Abiotic Systems	
Grade Level: 10	
Core Ideas: In this unit of study, students develop and use models, plan and carry out investigations, analyze and interpret data, and engage in argument from evidence to make sense of energy as a quantitative property of a system—a property that depends on the motion and interactions of matter and radiation within that system. They will also use the findings of investigations to provide a mechanistic explanation for the core idea that total change of energy in any system is always equal to the total energy transferred into or out of the system. Additionally, students develop an understanding that energy, at both the macroscopic and the atomic scales, can be accounted for as motions of particles or as energy associated with the configurations (relative positions) of particles. Students apply their understanding of energy to explain the role that water plays in affecting weather. Students examine the ways that human activities cause feedback that create changes to other systems. Students are expected to demonstrate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, engaging in argument from evidence, and using these practices to demonstrate understanding of core ideas.	
Standards (Content and Technology)	
CPI#:	**Statement:**
Performance Expectations (NJSLS)	
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.

Career Readiness, Life Literacies, and Key Skills	
9.1.12.EG.3	Explain how individuals and businesses influence government policies.
9.1.12.FP.3	Relate the concept of delayed gratification (i.e., psychological distance) to meeting financial goals, investing and building wealth over time.
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.4.12.CI.2:	Identify career pathways that highlight personal talents, skills and abilities
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving. **Computer Science and Design Thinking**	
8.1.12.IC.1	Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.IC.2	Test and refine computational artifacts to reduce bias and equity deficits.
8.1.12.IC.3	Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies have had on innovation and on a society's economy, politics, and culture.
8.2.12.ETW.4	Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.
Interdisciplinary Connection	
NJSLS.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
Companion Standards ELA/L	
NJSLSA.R1.	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.R2.	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
NJSLSA.R4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.

RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem

Cross-cultural Statements/Mandates (Amistad, Holocaust, LGBT, etc...)	
Reflect on the influence that Hispanic Americans; Blind, Deaf & Hard of Hearing Americans; members of the AAPI, the LGBTQ and handicapped community has had on our knowledge and understanding of chemistry	
Recognize the importance of self-confidence in handling daily tasks and challenges (CASEL)	
Develop, implement and model effective problem solving and critical thinking skills (CASEL)	
7.1.AL.IPRET.1	Identify main ideas and significant details in a range of oral, viewed, and written texts.
7.1.AL.IPRET.9	Differentiate facts from opinions by accurately answering most questions that require inferring implied meanings.

Unit Essential Question(s):

- Does thermal energy always transfer or transform in predictable ways?
- What makes water's properties essential to life on our planet? or Why do we look for water on other planets? or What makes water so special?
- How would I meet the energy needs of the house of the future?
- What is the best energy source for a home?

Unit Enduring Understandings:

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.
- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.
- Uncontrolled systems always move toward more stable states—that is, toward a more uniform energy distribution.
- Although energy cannot be destroyed, it can be converted into less useful forms—for example, to thermal energy in the surrounding environment.
- The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics.
- The functions and properties of water and water systems can be inferred from the overall structure, the way the components are shaped and used, and the molecular substructure.
- These properties include water's exceptional capacity to absorb, store, and release large amounts of energy; transmit sunlight; expand upon freezing; dissolve and transport materials; and lower the viscosities and melting points of rocks.
- All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors.
- Models can be used to simulate systems and interactions, including energy, matter, and information flows, within and between systems at different scales.
- Engineers continuously modify design solutions to increase benefits while decreasing costs and risks.
- Analysis of costs and benefits is a critical aspect of decisions about technology.

- Scientific knowledge indicates what can happen in natural systems, not what should happen. The latter involves ethics, values, and human decisions about the use of knowledge.
- New technologies can have deep impacts on society and the environment, including some that were not anticipated.
- Science and technology may raise ethical issues for which science, by itself, does not provide answers and solutions.
- Many decisions are made not using science alone, but instead relying on social and cultural contexts to resolve issues.

Evidence of Learning

Formative Assessments:

- Conferences
- Observations
- Question and Answer Sessions
- First Drafts / Quizzes
- Journals

Summative/Benchmark Assessment(s):

- Chapter/Unit tests
- Projects
- Performances
- Final copies

Alternative Assessment(s):

- Extended Projects
- Lab work
- Journaling

Resources/Materials:

Buthelezi, Thandi, Laurel Dingrando, Nicholas Hainen, Cheryl Wistrom, and Dinah Zike. *Glencoe Chemistry: Matter and Change*. Bothell, WA: McGraw-Hill Education, 2013. Print.

Key Vocabulary:

Closed system

Thermal

Calorimeter

Calories
Hydro
Energy
Mineral

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s) Suggested Tasks/Activities:	Day(s) to Complete
Investigations of thermal energy transfer	Investigate and describe a system focusing specifically on thermal energy transfer in a closed system https://chemcollective.org/thermo	5
Energy distribution in a system	Collect relevant data from several sources, including their own investigations, and synthesize their findings into a coherent understanding States of Matter (PhET) Biometricstrip video demo	5

Calorimeters	Create computational or mathematical models to calculate the change in the energy in one component of a system when the change in energy of the other component(s) and energy flows in and out of the systems are known Virtual Lab	5
Mechanical and chemical investigations of water	Investigate water's exceptional capacity to absorb, store, and release large amounts of energy; transmit sunlight; expand upon freezing; dissolve and transport materials; and lower the viscosities and melting points of rocks Student research and sharing of water's chemistry and properties. related to uses and importance	5
Water on Earth	Determine how the properties of water affect Earth materials and surface processes Student research and sharing of water's chemistry and properties. related to uses and importance	3
Resources	Use cost–benefit ratios to evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources What is Material Engineering (STEAM)	3

Teacher Notes:

Additional Resources:

Concord Consortium: Virtual Simulations: *http://concord.org/*
International Technology and Engineering Educators Association: *http://www.iteaconnect.org/* National Science Digital Library: *https://nsdl.oercommons.org/*

Click the links below to access additional resources used to design this unit:
https://phet.colorado.edu/en/simulations/category/chemistry
http://www.rsc.org/resources-tools/education-resources/

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	505Students
● Consult student IEP ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation	● Consult ELL student Plan ● Assign a buddy, same language or English speaking ● Allow errors in speaking ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions	● Consult G and T teacher ● Provide extension activities ● Build on students' intrinsic motivations ● Higher Level mathematical computations	● Consult with IR&S as needed ● Provide extended time to complete tasks ● Consult with Guidance	● Consult 504 Plan ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation

Midland Park Public Schools

Unit # - 3

Overview

Content Area: Chemistry

Unit Title: Bonding and Chemical Reactions

Grade Level: 10

Core Ideas: In this unit of study, students develop and by using models, plan and conduct investigations, use mathematical thinking, and construct explanations and design solutions as they develop an understanding of the substructure of atoms and to provide more mechanistic explanations of the properties of substances. Chemical reactions, including rates of reactions and energy changes, can be understood by students at this level in terms of the collisions of molecules and the rearrangements of atoms. Students also apply an understanding of the process of optimization and engineering design to chemical reaction systems. The crosscutting concepts of patterns, energy and matter, and stability and change are the organizing concepts for these disciplinary core ideas. Students are expected to demonstrate proficiency in developing and using models, planning and conducting investigations, using mathematical

thinking, and constructing explanations and designing solutions.	
Standards (Content and Technology)	
CPI#:	**Statement:**
Performance Expectations (NJSLS)	
HS-PS1-1 HS-PS1-2	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. 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-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-PS1-6	Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
HS-PS1-7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
Career Readiness, Life Literacies, and Key Skills	
9.1.12.EG.3	Explain how individuals and businesses influence government policies.
9.1.12.FP.3	Relate the concept of delayed gratification (i.e., psychological distance) to meeting financial goals, investing and building wealth over time.
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.4.12.CI.2:	Identify career pathways that highlight personal talents, skills and abilities
9.4.12.CT.2:	Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
Computer Science and Design Thinking	
8.1.12.IC.1	Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.IC.2	Test and refine computational artifacts to reduce bias and equity deficits.
8.1.12.IC.3	Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies have had on innovation and on a society's economy, politics, and culture.
8.2.12.ETW.4	Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.
Interdisciplinary Connection	

NJSLS.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
Companion Standards ELA/L	

NJSLSA.R1.	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.R2.	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
NJSLSA.R4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
Cross-cultural Statements/Mandates (Amistad, Holocaust, LGBT, etc...)	
Reflect on the influence that Hispanic Americans; Blind, Deaf & Hard of Hearing Americans; members of the AAPI, the LGBTQ and handicapped community has had on our knowledge and understanding ofchemical bonds and reactions	
Recognize the importance of self-confidence in handling daily tasks and challenges (CASEL)	
Develop, implement and model effective problem solving and critical thinking skills (CASEL)	
7.1.AL.IPRET.1	Identify main ideas and significant details in a range of oral, viewed, and written texts.
7.1.AL.IPRET.9	Differentiate facts from opinions by accurately answering most questions that require inferring implied meanings.

Unit Essential Question(s):

- Where do the atoms go during a chemical reaction?
- What is different inside a heat pack and a cold pack?
- Is it possible to change the rate of a reaction or cause two elements to react that do not normally want to?
- What can we do to make the products of a reaction stable?

Unit Enduring Understandings:

- The fact that atoms are conserved, together with the knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.
- The total amount of energy and matter in closed systems is conserved.
- The total amount of energy and matter in a chemical reaction system is conserved.
- Changes of energy and matter in a chemical reaction system can be described in terms of energy and matter flows into, out of, and within that system.
- Changes of energy and matter in a chemical reaction system can be described in terms of collisions of molecules and the rearrangements of atoms into new molecules, with subsequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.
- 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, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.
- A stable molecule has less energy than the same set of atoms separated; at least this much energy must be provided in order to take the molecule apart.
- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

- Patterns in the effects of changing the temperature or concentration of the reacting particles can be used to provide evidence for causality in the rate at which a reaction occurs.
- Much of science deals with constructing explanations of how things change and how they remain stable.
- In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present.
- Explanations can be constructed explaining how chemical reaction systems can change and remain stable.

Evidence of Learning

Formative Assessments:

- Conferences
- Observations
- Question and Answer Sessions
- First Drafts / Quizzes
- Journals

Summative/Benchmark Assessment(s):

- Chapter/Unit tests
- Projects
- Performances
- Final copies

Alternative Assessment(s):

- Extended Projects
- Lab work
- Journaling

Resources/Materials:

Buthelezi, Thandi, Laurel Dingrando, Nicholas Hainen, Cheryl Wistrom, and Dinah Zike. *Glencoe Chemistry: Matter and Change*. Bothell, WA: McGraw-Hill Education, 2013. Print.

Key Vocabulary:

Molecular

Energy

Mole

Molarity

Molality
Stoichiometry
Endothermic
Exothermic

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s) Suggested Tasks/Activities:	Day(s) to Complete

Mole concept and Stoichiometry	Show proportional relationships between masses of reactants and products	chem collective virtual labs and activities	4
Balancing Equations	Use balanced equations to show mass relationships between reactants and products	Balancing Equations (PhET lab)	4
Dimensional analysis	Gain an understanding of the use of dimensional analysis to perform mass to mole conversions that demonstrate how mass is conserved during chemical reactions	Mole Conversions (physicsclassroom concept builder)	4

Conservation of Energy	Demonstrate understanding of the conservation of energy within a system by emphasizing the key idea that a stable molecule has less energy than the same set of atoms when separated	Edpuzzle "Molecular Energy"	4
Molecular-level drawings	Analyze molecular-level drawings and tables showing energies in compounds with multiple bonds to show that energy is conserved in a chemical reaction.	molecular drawing	4
Endo vs Exothermic	Determine whether reactions are endothermic and exothermic, constructing explanations in terms of energy changes	online lesson guide (STEMlearning)	3
Le Chatelier's principle	Study the effect on reaction rates of changing the temperature and/or concentration of a reactant	Mr. Palermo's online lab	3
Equilibrium Rate of Reactions	Explore the concept of equilibrium through investigations, which may include manipulations of variables such as temperature and concentration Develop an explanation about the effects of changing the temperature or	Video: Crash Course #28 Oak National Academy online lesson "Rate of Reaction"	5 5

	concentration of the reacting particles on the rate at which a reaction occurs and on equilibrium	
Engineering application	Design a solution to specify a change in conditions that would produce increased amounts of products at equilibrium in order to produce the greatest amount of product from a reaction system Research and share project	5

Teacher Notes:

Additional Resources:
www.harpercollege.edu/tm-ps/chm/100/dgodambe/thedisk/equil/equil.htm
Science NetLinks: *http://www.aaas.org/program/science-netlinks*
North American Association for Environmental Education: *http://www.naaee.net/*

Click links below to access additional resources used to design this unit:
https://phet.colorado.edu/en/simulations/category/chemistry
http://www.rsc.org/resources-tools/education-resources/

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	506Students
● Consult student IEP ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation	● Consult ELL student Plan ● Assign a buddy, same language or English speaking ● Allow errors in speaking ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions	● Consult G and T teacher ● Provide extension activities ● Build on students' intrinsic motivations ● Higher Level mathematical computations	● Consult with IR&S as needed ● Provide extended time to complete tasks ● Consult with Guidance	● Consult 504 Plan ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation

Unit # - 4

Overview

Content Area: Chemistry

Unit Title: Ionic and Covalent Compounds; Acids and Bases

Grade Level: 10

Core Ideas: Atoms in ionic compounds are held together by chemical bonds formed by the attraction of oppositely charged ions. Ions are formed when atoms gain or lose valence electrons to achieve a stable octet electron configuration (noble gas electron configuration). Oppositely charged ions attract each other, forming electrically neutral ionic compounds. In written names and formulas for ionic compounds, the cation appears first, followed by the anion. Metals form crystal lattices and can be modeled as cations surrounded by a "sea" of freely moving valence electrons. Atoms in covalent compounds are held together by chemical bonds formed by the sharing of valence electrons. Atoms gain stability when they share electrons and form covalent bonds. Specific rules are used when naming binary covalent compounds and binary acids and oxyacids. Structural formulas show the relative positions of atoms within a molecule. The VSEPR theory is used to determine molecular shape. A chemical bond's character is related to each atom's attraction for the electrons in the bond.

Standards (Content and Technology)

CPI#:	**Statement:**
Performance Expectations (NJSLS)	
HS-PS1-1 HS-PS1-3 HS-PS1-6	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. 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. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials
HS-ESS3-2	Evaluate competing design solutions for developing, managing and utilizing energy and mineral resources based on cost-benefit ratios
Career Readiness, Life Literacies, and Key Skills	
9.1.12.EG.3	Explain how individuals and businesses influence government policies.
9.1.12.FP.3	Relate the concept of delayed gratification (i.e., psychological distance) to meeting financial goals, investing and building wealth over time.
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.4.12.CI.2:	Identify career pathways that highlight personal talents, skills and abilities
9.4.12.CT.2:	Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
Computer Science and Design Thinking	
8.1.12.IC.1	Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.IC.2	Test and refine computational artifacts to reduce bias and equity deficits.
8.1.12.IC.3	Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies have had on innovation and on a society's economy, politics, and culture.
8.2.12.ETW.4	Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.

Interdisciplinary Connection	
NJSLS.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
Companion Standards ELA/L	
NJSLSA.R1.	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.R2.	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

NJSLSA.R4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
Cross-cultural Statements/Mandates (Amistad, Holocaust, LGBT, etc...)	
Reflect on the influence that Hispanic Americans; Blind, Deaf & Hard of Hearing Americans; members of the AAPI, the LGBTQ and handicapped community has had on our knowledge and understanding of compounds and acids and bases	
Recognize the importance of self-confidence in handling daily tasks and challenges (CASEL)	
Develop, implement and model effective problem solving and critical thinking skills (CASEL)	
7.1.AL.IPRET.1	Identify main ideas and significant details in a range of oral, viewed, and written texts.
7.1.AL.IPRET.9	Differentiate facts from opinions by accurately answering most questions that require inferring implied meanings.

Unit Essential Question(s):

- Why do bonds form?
- What are the major similarities and differences between ionic and covalent bonds?
- How do shape, electronegativity, and polarity relate to one another?
- How can the shape, bond angles, and polarity be predicted using VSEPR theory?
- How does metallic bonding structure affect the properties of a metal?
- How does crystal lattice structure affect the properties of an ionic compound?
- What are the rules for ionic, covalent, and acid naming and formula writing?

Unit Enduring Understandings:

- Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons.
- Much of science deals with constructing explanations of how things change and how they remain stable.
- The structure and interactions of matter at the bulk scale 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 between material objects.

Evidence of Learning

Formative Assessments:

- Conferences
- Observations
- Question and Answer Sessions
- First Drafts / Quizzes
- Journals

Summative/Benchmark Assessment(s):

- Chapter/Unit tests
- Projects
- Performances
- Final copies

Alternative Assessment(s):

- Extended Projects
- Lab work
- Journaling

Resources/Materials:

Buthelezi, Thandi, Laurel Dingrando, Nicholas Hainen, Cheryl Wistrom, and Dinah Zike. *Glencoe Chemistry: Matter and Change*. Bothell, WA: McGraw-Hill Education,

Key Vocabulary:

Ions

Cations

2013. Print.	Anions Chemical Bonds Ionic

	Covalent Hydrogen Bonds Acid Base

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s) Suggested Tasks/Activities:	Day(s) to Complete
Cations and anions	Identify and Name ions Common Ions and their importance/value research poster Practice worksheets	4
Ionic Compounds	Name and describe formation of various ionic compounds Professor Dave Explains Video Practice Worksheet	4
Properties and uses	Identify the properties of an ionic compound, including melting point, boiling point, lattice energy, and hardness and relate to the uses of various ionic compounds Naming Ionic Compounds Match the property to compound game	7
Covalent Compounds	Explain how shape, electronegativity, and polarity relate to one another Molecular Models Chart	5
Formulas Bond type	Write formulas for binary molecular compounds Identifying Molecules Kahoot Apply electronegativity values to predict bond type Inquiry Based Activity	3 3
Naming Acids	Name binary acids and oxyacids. Practice Worksheets	3
Properties of Acids,Bases Uses of Acids and	Distinguish the properties of acids and bases Compare and Contrast Poster Identify and model the uses of acidic and All acids are harmful – or are they?	4 5

Bases	basic compounds in biological functions, industrial uses and other real life applications (SAILS resource) Research and Present	

Teacher Notes:

Additional Resources:
ttp://www.periodni.com/solcalc-chemical_compounds.html
http://www.compoundchem.com/

Click links below to access additional resources used to design this unit:
https://phet.colorado.edu/en/simulations/category/chemistry
http://www.rsc.org/resources-tools/education-resources/

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	507Students
● Consult student IEP ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation	● Consult ELL student Plan ● Assign a buddy, same language or English speaking ● Allow errors in speaking ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions	● Consult G and T teacher ● Provide extension activities ● Build on students' intrinsic motivations ● Higher Level mathematical computations	● Consult with IR&S as needed ● Provide extended time to complete tasks ● Consult with Guidance	● Consult 504 Plan ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation

Midland Park Public Schools

Unit # - 5

Overview

Content Area: Chemistry

Unit Title: Nuclear Chemistry

Grade Level: 10

Core Ideas: In this unit of study, energy and matter are studied further by investigating the processes of nuclear fusion and fission that govern the formation, evolution, and workings of the solar system in the universe. Some concepts studied are fundamental to science and demonstrate scale, proportion, and quantity, such as understanding how the matter of the world formed during the Big Bang and within the cores of stars over the cycle of their lives. In addition, an important aspect of Earth and space sciences involves understanding the concept of stability and change while making inferences about events in Earth's history based on a data record that is increasingly incomplete the farther one goes back in time. A mathematical analysis of radiometric dating is used to comprehend how absolute ages are obtained for the geologic record. The crosscutting concepts of energy and matter; scale, proportion, and quantity; and stability and change are called out as organizing concepts for this unit. Students are expected to demonstrate proficiency in developing and using models; constructing explanations and designing solutions; using mathematical and computational thinking; and obtaining, evaluating, and communicating information; and they are expected to use these practices to demonstrate understanding of the core ideas.

Standards (Content and Technology)

CPI#:	**Statement:**
Performance Expectations (NJSLS)	
HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion and radioactive decay
HS-ESS1-1	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
HS-ESS1-2	Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe
Career Readiness, Life Literacies, and Key Skills	
9.1.12.EG.3	Explain how individuals and businesses influence government policies.
9.1.12.FP.3	Relate the concept of delayed gratification (i.e., psychological distance) to meeting financial goals, investing and building wealth over time.
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
9.4.12.CI.2:	Identify career pathways that highlight personal talents, skills and abilities
9.4.12.CT.2:	Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
Computer Science and Design Thinking	
8.1.12.IC.1	Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.IC.2	Test and refine computational artifacts to reduce bias and equity deficits.
8.1.12.IC.3	Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies have had on innovation and on a society's economy, politics, and culture.
8.2.12.ETW.4	Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.
Interdisciplinary Connection	

NJSLS.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
Companion Standards ELA/L	
NJSLSA.R1.	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.R2.	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
NJSLSA.R4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
Cross-cultural Statements/Mandates (Amistad, Holocaust, LGBT, etc...)	
Reflect on the influence that Hispanic Americans; Blind, Deaf & Hard of Hearing Americans; members of the AAPI, the LGBTQ and handicapped community has had on our knowledge and understanding of nuclear chemistry	
Recognize the importance of self-confidence in handling daily tasks and challenges (CASEL)	
Develop, implement and model effective problem solving and critical thinking skills (CASEL)	
7.1.AL.IPRET.1	Identify main ideas and significant details in a range of oral, viewed, and written texts.
7.1.AL.IPRET.9	Differentiate facts from opinions by accurately answering most questions that require inferring implied meanings.

Unit Essential Question(s):

- Why is fusion considered the Holy Grail for the production of electricity?
- Why aren't all forms of radiation harmful to living things?
- How do stars produce elements?
- Is the lifespan of a star predictable?
- If there was nobody there to Tweet about it, how do we know that there was a Big Bang?
- How can chemistry help us to figure out ancient events?

Unit Enduring Understandings:

- Nuclear processes, including fusion, fission, and radioactive decay of unstable nuclei, involve release or absorption of energy.
- Nuclear fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation.
- The significance of the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth is dependent on the scale, proportion, and quantity at which it occurs.
- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth.
- The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars and nonstellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe.
- Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode.
- Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities.
- Energy cannot be created or destroyed, only moved between one place and another place, between objects and/or fields, or between systems.
- Science and engineering complement each other in the cycle known as research and development (R&D).

- Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and will continue to do so in the future.
- Science assumes the universe is a vast single system in which basic laws are consistent.
- A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment, and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence.
- Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history.
- Spontaneous radioactive decay follows a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials.

Evidence of Learning

Formative Assessments:
- Conferences
- Observations
- Question and Answer Sessions
- First Drafts / Quizzes
- Journals

Summative/Benchmark Assessment(s):
- Chapter/Unit tests
- Projects
- Performances
- Final copies

Alternative Assessment(s):
- Extended Projects
- Lab work
- Journaling

Resources/Materials:

Buthelezi, Thandi, Laurel Dingrando, Nicholas Hainen, Cheryl Wistrom, and Dinah Zike. *Glencoe Chemistry: Matter and Change*. Bothell, WA: McGraw-Hill Education,

Key Vocabulary:

radioactive decay

alpha

beta

2013. Print.

gamma
fission fusion
red shirt
blue shift

Suggested Pacing Guide

Midland Park Public Schools

Lesson Name/Topic	Student Learning Objective(s) Suggested Tasks/Activities:	Day(s) to Complete
Fission, Fusion and radioactive decay	Develop and use models to illustrate the processes of fission, fusion, and radioactive decay — Chemistry Crash Course #38	3
Energy of Nuclear Chemistry	Explain the scale of energy released in nuclear processes relative to other kinds of transformations, such as chemical reactions — Chemistry Crash Course #38	2
Radioactive decay Processes	Illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of alpha, beta, and gamma radioactive decays — PhET "Alpha Decay"	3
Stellular Composition	Identify compositional elements of stars, their movements, and their distances from Earth — Khan Academy: 3.2—Way of Knowing: Stars and Elements	2
Light spectra and brightness	Develop an understanding of how analysis of light spectra gives us information about the composition of stars and interstellar gases — Electron Energy and Light POGIL Activity	3
Nuclear Fusion	Illustrate the relationship between nuclear fusion in the sun's core and energy that reaches the Earth in the form of radiation — Khan Academy: Chemical Abundances: The Sun	2
Chemistry and the Big Bang Theory	Apply the red shift/blue shift, wavelength relationships to energy, and universe — What is Your Cosmic Connection to the Elements? - NASA	3

	expansion as pieces of evidence for the Big Bang Theory	
Chemistry and the Earth's Age	Use examples of spontaneous radioactive decay as a tool to determine the ages of rocks or other materials Uses of Radioactive Isotopes - NEWSELA and Edpuzzles	2
Earth's formation	Make claims about Earth's formation and early history supported by data while considering appropriate units, quantities and limitations on measurement Radioactive Dating Game(PhET)	2

Teacher Notes: much of this material and the standards may be covered throughout the other units in the year

Additional Resources:
Click links below to access additional resources used to design this unit:
https://phet.colorado.edu/en/simulations/category/chemistry
http://www.rsc.org/resources-tools/education-resources/

Differentiation/Modification Strategies

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	508Students
● Consult student IEP ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation	● Consult ELL student Plan ● Assign a buddy, same language or English speaking ● Allow errors in speaking ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions	● Consult G and T teacher ● Provide extension activities ● Build on students' intrinsic motivations ● Higher Level mathematical computations	● Consult with IR&S as needed ● Provide extended time to complete tasks ● Consult with Guidance	● Consult 504 Plan ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation