Chem Unit #1: Structures and Properties of Matter

Content Area:	**Science**
Course(s):	**CP CHEMISTRY, HON CHEMISTRY**
Time Period:	**Marking Period 1**
Length:	**60 days**
Status:	**Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.2	Analyze factors that influence the emotional and social impact of mental health illness on the family.
SCI.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.
SCI.HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
SCI.MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
SCI.MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
TECH.9.4.12.TL.2	Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
TECH.9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).
	Develop a model based on evidence to illustrate the relationships between systems or between components of a system.
	Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
	Advanced search techniques can be used with digital and media resources to locate information and to check the credibility and the expertise of sources to answer questions, solve problems, and inform the decision-making.

Phenomenon

Science and Engineering Practices

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).

Planning and carrying out investigations in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

Asking questions and defining problems in grades 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

Mathematical and computational thinking at the 9–12 builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

Disciplinary Core Ideas

SCI.HS.PS1.A	Structure and Properties of Matter
SCI.HS.PS1.B	Chemical Reactions
SCI.HS.PS2.B	Types of Interactions
SCI.HS-PS1	Matter and Its Interactions

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.

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.

Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons.

The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.

Cross Cutting Concepts

SCI.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.

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.

Interdisciplinary Connections

Math

MA.H.ME.1a1	Determine the necessary unit(s) to use to solve real world problems
MA.H.ME.1a2	Solve real world problems involving units of measurement
MA.H.NO.1a3	Convert a number expressed in scientific notation
MA.H.DPS.1d1	Represent data on a scatter plot to describe and predict
MA.H.DPS.1d2	Select an appropriate statement that describes the relationship between variables
MA.ME-1	Explore relationships among units, attributes, and measures within a system of measurement: Identify measurement attributes and units; Use measurement attributes to describe and compare objects, situations, or events.

ELA

LA.W.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.W.9-10.9	Draw evidence from literary or nonfiction informational texts to support analysis, reflection, and research.

World Language

WL.7.1.IH.A.L.1.a	Analyze written and oral text.
WL.7.1.IH.A.L.1.d	Infer meaning of unfamiliar words in new contexts.
WL.7.1.IH.B.L.1.a	Infer meaning of unfamiliar words in new contexts.
WL.7.1.IH.B.L.1.d	Compare and contrast.

Transfer Goals

How can one explain the structure, properties, and interactions of matter?

In this unit of study, students develop and use 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. 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.

Understandings

- Atomic models are constructed to explain experimental data on atoms.
- Atoms are composed of three subatomic particles, the proton, neutron and electron. Each subatomic particle has mass, a charge and a specific location within the atom. These specifics have been determined through experimentation and revised models over time.
- Energy is neither created no destroyed; it only changes form. Chemical reactions result in a change of energy.
- Everything around us is matter. Matter comes in different forms, but it is all composed of atoms.
- Melting and boiling points differ in different substances due to intermolecular forces.
- Reactions can be classified based on the reactants and products.
- The Kinetic Molecular Theory describes substances at the molecular level. This can be used to determine their phase.
- The Periodic Table is arranged by atomic number. This arrangement places elements with similar properties together.
- The outermost electrons of an element will determine the reactivity of the element. They will also determine the bonding of that element.
- The principle of conservation of matter allows us to balance chemical equations.

Knowledge

- An atoms electron configuration determines how atoms interact with each other and how bonds form.
- Outermost electrons determine the reactivity of the elements and the nature of chemical bonds that they form.
- Atomic models are used to predict the behaviors of atoms in interactions.
- Chemical bonds are the interactions between atoms that hold them together in molecules or between oppositely charged ions.
- Conservation of mass in a chemical reaction enables us to balance a chemical equation and to use the mole concept to calculate the mass of products and reactants.
- How to account for melting and boiling points of various compounds.
- In the periodic table, elements are arranged according to the number of protons, which is the atomic number.
- Kinetic energy is needed to change phases.
- Reactions involve the transfer of electrons or hydrogen ions between reacting species. Reactions may also involve atoms interacting with each other to create a bond.
- The Kinetic Molecular Theory can be used to explain the properties of solids, liquids and gases.
- The placement of elements on the Periodic Table based on their physical and chemical properties

Skills

- Calculate the number of protons, neutrons and electrons of an element
- Describe our world, phases and phase changes in terms of kinetic and potential energy.
- Describe solids, liquids and gases at the molecular level and use that to describe their physical

properties.

- Determine properties of an element on the periodic table based on the properties of elements in the same row or column
- Determine the electron configuration of all of the elements on the periodic table.
- Determine the type of bond that an atom will have based on its place on the Periodic Table and its outermost electrons.
- Draw Lewis structures.
- Find an element on the Periodic Table based on its atomic number.
- Identify and balance reactions based on elements and electrons (charges).
- Use intermolecular forces to account for melting and boiling point variations between compounds.
- Use the Kinetic Molecular Theory to describe solids, liquids and gases.

Essential Questions

- What is the importance of the nucleus of an atom?
- How can one be sure their calculations are precise and accurate?
- How can one determine the reactivity of an element?
- How can one use the Periodic Table to determine the characteristics of an element?
- How do properties provide evidence of the identity of materials?
- How is matter characterized?

Technology Integration and Differentiated Instruction

Technology Integration

- **Resources**
  - Google Classroom and Microsoft OneNote- Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
  - Additional resources including but not limited to, Bozeman Science videos, Crash Course Chemistry lessons and instructional videos by Tyler DeWitt enable students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.
- **One to One Student's laptop**
  - All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❑ All assignments have been created in the student's native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❑ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❑ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Stage 2

Performance Tasks

- Alien planet element placement – students will be given generic elements and asked to categorize them based on their properties. This is to mimic how the periodic table is organized.
- Element Web Quest
- Family investigation Web Quest – students will work in groups to investigate how a family reacts with other elements as well as how we use them in our lives.
- Lab – Conservation of Mass
- Lab – Drops on a penny

- Lab – Heating and Cooling Curves
- Lab- Boyle's Law - Manual Lab
- Lab- Boyle's Law - Vernier data

Other Evidence

- POGIL – Balancing Equations
- POGIL – Types of Reactions
- Review Sheets
- Textbook problems
- Warm ups

Stage 3 - Learning Plan

Unit 1a: The Atom and the Periodic Table

(Holt Chapters 1, 2, 3, 4, 5)

Use Textbook (Holt: Modern Chenmistry) as basis of lectures and notes.

- Modifications: Give written notes as reqested to students with accomidations and/or lower level learners.

Activities:

- Multiple DI activities used to reach all levels of learners, such as but not limited to, vocabulary carousel, give one - get one, vocabulary scavenger hunt, Frayer model, vocabulary ladders, jig saw, and picture walks.

Suggested Differentiated Activities:

Element ADventure webquest

- modifications: elements given out based on difficulty and level of learning.

Periodic Table Family Activity

Various wokrsheets used to learn the elements of the peridic table.

POGIL (Inquilry Learning) - Atoms and their Isotopes

PHET Simulation: Parts of an Atom

POGIL electrons structures

Electron Configuration BINGO

Graphing Periodic Trends

PHET Simulation: Build an Atom

Suggested Labs:

Safety Lab - an introduction to the chemistry laboratory

Flame Test Lab

Spectroscopy Lab

Alkaline Earth Metals Lab

Conservation of Mass Lab

Investigating Chemical and Physical Properties Lab

Investigating Differences in Activity of Metals

Density Lab

4 Metals Density Lab

Boyle's Law Labs

Gas Law Mini-Lab - demonstration of all gas laws

Modifications

- Special Education:
  - Modify unit assessments by adding word banks, enlarging text, visual aids, highlighted directions, etc.
  - Provide highlighted notes and readings when necessary
  - Assign cooperative learning projects/assignments in which the groups are heterogeneously mixed by ability level/learning style.
  - Student created graphic organizers
  - Differentiated activities/review
  - Project based assessments/Portfolios
  - Utilize technology

- Gifted Students:
  - Gifted students may create their own learning plan that allows the student to further investigate a topic of interest and/or advance a specific skill.
  - Students may be provided with more advanced culturally authentic texts.
  - Provide Enrichment quesstions.

WEEKLY LEARNING PLANS

CP Chemistry:

Week 1-2:

Chapter 1

Lab: Introduction to Lab/Safety in a Chemistry Lab

Vocabulary Carousel of Chapter 1 Vocabulary

Vocabulary Ladder Activity with Chapter 1 Vocabulary

Chapter 1 Lecture 1 - Definitions of Matter

Project: Element ADventure

Element Adventure Project

Elements and their symbols worksheet

ELEMENTary my Dear Watson worksheet

Chemistry PUNishment

Present Advertisements

Element Quiz

Safety Quiz

Week 3:

Chapter 1

Lab:Team Building

Lab: Four Liquids

Families on the Periodic Table Project

Lecture 2: Families of the Periodic Table

Metals vs. Nonmetals worksheet

Video –Matter by Bozeman Science

Present Family Project

Chapter 1 Review Sheet

Chapter 1 Test

Week 4-5:

Chapter 2

Lecture: Significant Digits, Accuracy, Precision

Significant Digits worksheet

Density worksheet

Density Lab

Lecture: Dimensional Analysis

Conversion Factors worksheet

SigFig, density, dimensional analysis quiz

Week 6:

Chapter 2

Lecture: Gases

Problem Solving: Boyle's Law

Practice: Boyle's Law worksheet

Boyle's Law Lab

Problem Solving: Charles' Law

Practice: Charles' Law worksheet

Week 7:

Chapter 3

Lecture 3: Protons, Neutrons and Electrons

Period 4: LAB – Conservation of Mass

Inquiry: Inquiry into the Atom

Parts of an atom worksheet

Atom Tutorial

Proton, neutron and electron worksheet

POGIL - atoms and their isotopes

Protons, neutrons and electrons activity

Video – Bozeman Science – Parts of an atom part 1

PHET – parts of an atom

PHET - Build an Atom

Video – Bozeman Science – Parts of an atom part 2

Week 8:

Chapter 3

Atom Song

Scientists Packet

Review sheet

Lab: Flame Tests – no prelab

Reading: Scientists of the Atom

Review for chapter 3 quiz

Chapter 3 Test

Week 9:

Chapter 4

Lecture – chapter 4: Electron configuration

Flame Tests (no pre-lab)

Lab: Spectroscopy

POGIL: Lewis Structures

Lecture – Using the Periodic Table to determine electron configurations

Electron Configuration practice

Video – Bozeman Science and electron configurations

Electron Configuration Practice

Make bingo Cards for tomorrow

Electron Configuration BINGO

Chapter 4 Review Sheet

Week 10:

Chapter 4 and 5

Lab Period 8: Spectroscopy (no pre-lab)

Lab: Alkaline Earth Metals

Go Over Review

Practice electron configurations

Lab Period 8: Spectroscopy (no pre-lab)

Chapter 5 Lecture- Periodic Trends

Graphing Periodic Trends

Chapter 4 and 5 Test

Honors Chemistry

Week 1-2:

Chapter 1 -

Introduction to Class

Vocabulary Carousel Activity

Safety Quiz

Element Adventure Project

Video – Matter by Bozeman Science

Lecture 1

Chemistry PUNishment

Physical vs, Chemical properties worksheet

Element Quiz

Present Advertisements

Video Tutorial – parts of the atom

Week 3-4:

Chapter 2 -

Lab 26: Alkaline Earth Metals

History of the Atom – Video from Crash Course Chemistry

POGIL – Parts of an atom

Lecture 2

The Atom Song

Counting Protons, Neutrons and Electrons Practice

More practice counting protons, neutrons and electrons

Families of the Periodic Table Project

Metals vs nonmetals

Lab 26: Alkaline Earth Metals

Present Family Project

Video – History of the Periodic Table

Lecture 3

Chapter 1 and 2 Review sheet

Test – Chapter 1 and 2

Chem Unit #2: Bonding and Chemical Reactions (Interactions of Matter)

Content Area:	**Science**
Course(s):	**CP CHEMISTRY, HON CHEMISTRY**
Time Period:	**Marking Period 2**
Length:	**30 days**
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Standards and Phenomena

Science Standards

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HE.9-12.2.1.12.EH.2	Analyze factors that influence the emotional and social impact of mental health illness on the family.
SCI.HS-LS1-6	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
SCI.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.
SCI.HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
SCI.HS-PS1-7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
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Science and Engineering Practices

Planning and Carrying Out Investigations

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Constructing explanations and designing solutions in 9–12 builds on K–8 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Constructing Explanations and Designing Solutions

Constructing Explanations and Designing Solutions

Planning and carrying out in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

Developing and Using Models

Disciplinary Core Ideas

SCI.HS.PS1.B	Chemical Reactions
	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.
	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.

Cross-Cutting Concepts

The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.

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

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.

Transfer Goals

In this unit of study, students develop and 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.

Understandings

- • 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.
- • 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 system can be described in terms of energy and matter flows into, out of, and within that system.
- • 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.
- • Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others may be needed.
- • 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.
- • Much of science deals with constructing explanations of how things change and how they remain stable.
- • 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.

Knowledge

- • 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.
- • Explanations can be constructed explaining how chemical reaction systems can change and 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.
- • 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.
- • The total amount of energy and matter in a chemical reaction system is conserved.
- • The total amount of energy and matter in closed systems is conserved.

Skills

- • Apply scientific principles and multiple and independent student-generated sources of evidence to provide an explanation of the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

- • Break down and prioritize criteria for increasing amounts of products in a chemical system at equilibrium.
- • Construct explanations for how chemical reaction systems change and how they remain stable.
- • Describe changes of energy and matter in a chemical reaction system in terms of energy and matter flows into, out of, and within that system
- • Describe changes of energy and matter in a chemical reaction system in terms of energy and matter flows into, out of, and within that system.
- • Describe chemical processes, their rates, and whether or not they store or release energy 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.
- • Design a solution to specify a change in conditions that would produce increased amounts of products at equilibrium in a chemical system based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.
- • Develop a model based on evidence to illustrate the relationship between the release or absorption of energy from a chemical reaction system and the changes in total bond energy.
- • Explain the idea that a stable molecule has less energy than the same set of atoms separated.
- • Refine the design of a solution to specify a change in conditions that would produce increased amounts of products at equilibrium in a chemical system based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.
- • Use mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and products and the translation of these relationships to the macroscopic scale, using the mole as the conversion from the atomic to the macroscopic scale.
- • Use mathematical representations of chemical reaction systems to support the claim that atoms, and therefore mass, are conserved during a chemical reaction
- • Use patterns in the effects of changing the temperature or concentration of the reactant particles to provide evidence for causality in the rate at which a reaction occurs
- • Use the fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, to describe and predict chemical reactions.
- • Use the number and energy of collisions between molecules (particles) to explain the effects of changing the temperature or concentration of the reacting articles on the rate at which a reaction occurs.

Essential Questions

- How can one explain the structure, properties, and interactions of matter?

Technology Integration and Differentiated Instruction

Technology Integration

- **Resources**
  - Google Classroom and Microsoft OneNote- Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick

Checks, Additional Resources/ Support, Homework, etc.)

- Additional resources including but not limited to, Bozeman Science videos, Crash Course Chemistry lessons and instructional videos by Tyler DeWitt enable students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

● **One to One Student's laptop**

- All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❏ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❏ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❏ All assignments have been created in the student's native language.

❏ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❏ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❏ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❏ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

MATH - Use mathematical models (graphs, equations) .

SOCIAL STUDIES – Discuss advances in science and the impact they have on society.

WORLD LANGUAGES - Explore the etymology of chemistry-related terms to gain an understanding of their meaning and relationships and other terms. Include topic-related articles within lessons.

VISUAL/PERFORMING ARTS – Prepare and present multimedia presentations.

APPLIED TECHNOLOGY - Use on-line tools to evaluate various standards.

BUSINESS EDUCATION -

GLOBAL AWARENESS – Discuss global impact of diverse contributions to chemistry.

Stage 2 - Assessment

Performance Tasks

- Lab - Types of Reactions
- Lab – Mole and mass relationships
- Lab – Relating moles to coefficients in a balanced equation
- Lab – Solubility Inquiry Lab
- Students will use their knowledge of chemistry and the periodic table to investigate a death using Chem Collective – Mixed Reception. http://collective.chem.cmu.edu/MixedReception/game/main.html
- Students will write their own lab. They will test the rates of dissolving based on the factors of temperature, stirring and surface area

Other Evidence

- POGIL - Types of Reactions
- Mole Madness Activity
- Quiz
- Textbook Problems
- Unit 3 Test

- Warm ups

Stage 3 - Learning Plan

Unit 2: Interactions with Matter

(Holt Chapters 6, 7, 8 and 9 - Honors Chapters 2,3,4,7 and 9) - Bonding, Nomenclature, Types of Reactions and Stiochiometry

Use Textbook (Holt: Modern Chenmistry and Honors Text) as basis of lectures and notes.

- Modifications: Give written notes as reqested to students with accomidations and/or lower level learners.

Suggested Differentiated Activities:

- Modifications: Multiple DI activities used to reach all levels of learners, such as but not limited to, vocabulary carousel, give one - get one, vocabulary scavenger hunt, Frayer model, vocabulary ladders, jig saw, and picture walks.

Applicable worksheets

Green Pea Analogy

Round table Poblem Solving

POGIL: Collision Theory

Bonding activity

Drawing Lewis Structures worksheets

Criss Cross grid - nomenclature

Intermolecular Forces Activity

Vocabulary Ladder

POGIL LEwis Strucrures

Naming Chemical Compounds

POGIL Mole and Molar Mass

PHET Balancing Chemical Equations Worksheet

POGIL Types of Reactions

Mixed Reception - Murder Mystery

Mass - mass Problems

Mole- Mole Problems

Round Table Stoichiometry

Stoichiometry Race- Group work

Covalent Bond Inquiry - Bingo Chips

Ionic Bond Inquiry - Bingo Chips

Labs:

Mole Madness

Mole and Mass Relationships

Intermolecular Forces Lab

Bulding 3D Molecules Lab

Honors:

Determine empirical formulas

Determine Precent composition

Calculate molecular Formulas

Limiting Reactant Problems

Modifications

- Special Education:
  - Modify unit assessments by adding word banks, enlarging text, visual aids, highlighted directions, etc.
  - Provide highlighted notes and readings when necessary
  - Assign cooperative learning projects/assignments in which the groups are heterogeneously mixed by ability level/learning style.
  - Student created graphic organizers
  - Differentiated activities/review
  - Project based assessments/Portfolios

        - Utilize technology

    - Gifted Students:

        - Gifted students may create their own learning plan that allows the student to further investigate a topic of interest and/or advance a specific skill.

        - Students may be provided with more advanced culturally authentic texts.

CP Chemistry:

Week 1: Chapter 6 -

Lab – Alkaline Earth Metals
POGIL – Lewis Structures
Lecture Unit 1b part 1 – Chapter 6 of textbook
Video – Bozeman Science: Electronegativity and Bonding
Video – Bozeman Science Lewis Structures
Start Lewis Structures Activity with Bingo Chips

Inquiry: Ionic Bonding

Inquiry: Covalent Bonding
Practice drawing Lewis Dot Diagrams worksheet

Lecture – Ionic bonding and shapes

Lab – 3D Molecules (pre-lab required)
Practice drawing diagrams and naming the shapes
Video – Tyler DeWitt – VSEPR Theory introduction

Week 2- Chapter 6 Continued

More Practice with Lewis structures and shapes

Reading: "Linus Pauling American Hero" ChemMatters Magazine, ACS 2007
Finish classwork
Intermolecular Force investigation
Lecture – Intermolecular Forces
Chapter 6 Extra Practice Drawing Lewis Structures
Chapter 6 Vocabulary Ladder Activity
Chapter 6 Review sheet
Lab – Heating and Cooling Curves (pre-lab required)
Chapter 6 Quiz

Chapter 10 Lecture

Naming Compounds and Molecules Packet

Week 3 - Chapter 7 & 10
Practice Naming
Video- Bozeman Science Nomenclature

Video – Bozeman Science Solids and Liquids
Heating Curve Simulation
Video – Bozeman Science – Kinetic Molecular Theory

Lab - Pressure and volume relationship – no pre-lab
Gas Laws investigation
Chapter 11 Lecture

PHET – Solids and Liquids

Week 4 - Conclusion of Chapters 6, 7, 10 & 9

Unit 1b Review Sheet
Lab – Pressure and volume relationship – no pre-lab

Period 5 Lab 15 - Relating moles to coefficients in a balanced equation
Video Quiz
Practice mole - mole problems (11-1 Practice Problems)
Introduce mass to mass problems
11-2 Practice Problems 1-9 odd
Lab 15 - Relating moles to coefficients in a balanced equation
Work on practice problems (2-8 even)
More Practice Problems
Lecture: Volume and stoichiometry
DI Activity – Roundtable Problem Solving

Lecture: Acids and Bases

Lab: Indicators

“Acidic Seas: How Carbon Dioxide is Changing the Oceans” Close Reading

Week 5: Chapter 9 -

Lab - Lab 16: mole and mass relationships
POGIL - Limiting Reactant
HW: Finish POGIL

Introduce percent yield
Holt Modern Chemistry Section 3 worksheet

11-3 Practice Problem worksheet (23-27)
Review Sheet
REVIEW

Honors Chemistry:

Week 1: Chapter 7 -

Lewis Structures POGIL
Lecture – Lewis Structures

Lab – 3D molecules
Watch Bozeman Science Video on Lewis Structures
Video - VSEPR Theory: Introduction by Tyler DeWitt
Lewis Structures Practice
Lecture 2 – shapes of moleculesMore Lewis Structures practice
Chapter 7 Review Sheet

Test Chapter 7

Week 2: Chapter 9 -

Use TEXTBOOK to fill in notes on 9.1

Lab: Bubbles
Intermolecular Forces group work
Use TEXTBOOK to fill in notes on 9.2
Textbook problems page 268 #1,5,11,15,19,23
Take notes on 9.3 using textbook
Take notes on 9.4 using textbook

Textbook problems page 268 #25, 31, 36, 40
Take notes on 9.5 from textbook
Textbook problems page 270 #49, 51
Work on review (optional)
Lab: Investigations of Gas Laws
Chapter 9 Test

Week 3: Chapter 5 -
Video – Kinetic Molecular theory
POGIL – Kinetic Molecular theory
Lecture – Kinetic Molecular Theory and finish POGIL

PHET – Simulation of Gas Laws
Video – Bozeman Science "Gases"

Conversion Practice Problems
Lecture Textbook 5.1 and 5.2

Textbook problems #1,2,3,7,8,9

Ideal Gas Law Practice

Lab: Vernier Lab – Pressure vs. Volume
Naming compounds packet
Video – Bozeman Science NomenclatureVideo Quiz

Week 2: Chapter 5/3 -

Mole Song
Mole ratio
Practice mole-mass
Video – Converting mole to mass

POGIL Uses of Ideal Gas Law
Lecture Textbook 5.3 – uses of Ideal Gas Law

Video – final and initial state – Tyler DeWitt "Be Lazy! Don't Memorize the Gas Laws

Types of Reactions
Practice Final and Initial State problems
Chapter 5 Review sheet
Unit 1b TEST

Week 2: Chapter 4 -

DI Activity - Vocabulary Scavenger Hunt
Types of Chemical Reactions packet
Predicting products of reactions - Group work
Predicting solubility
Video - net ionic equations
Practice writing net ionic equations
LAB 41: Redox: Reduction-oxidation Reactions FORMAL LAB
Acids and Bases - using textbook and outline
Tutorial - determining oxidation numbers
Introduce reduction and oxidation
Video - Balancing redox reactions

Week 4: Chapter 4 -
Balancing Redox reactions
worksheet -(3-9 odds)
Round Table Redox Practice
Complete Outline up to and including Redox.
Concentration video
LAB Electrochemistry
Concentration - Molarity and Molality - define in groups
Practice problems on molarity and molality
Chapter 4 TEST

- Perfect 10 (DI)
- Round Table – Conversion using dimensional analysis (DI)
- Round Table – Stoichiometry (DI)
- Vocabulary Ladder (DI)
- Vocabulary Scavenger Hunt (DI)

Chem Unit #3: Energy in Chemical Systems

Content Area: **Science**
Course(s): **CP CHEMISTRY, HON CHEMISTRY**
Time Period: **Marking Period 3**
Length: **15 days**
Status: **Published**

Standards and Phenomenon

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
SCI.HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
SCI.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
SCI.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.
SCI.HS-PS3-2	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).
SCI.HS-PS3-1	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
SCI.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.
SCI.HS-PS3-4	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

Science and Engineering Practices

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).

Developing and Using Models

Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

Planning and Carrying Out Investigations

Disciplinary Core Ideas

SCI.HS.PS3.B	Conservation of Energy and Energy Transfer
SCI.HS.PS3.D	Energy in Chemical Processes
	Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.
	Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment.
	Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down).

Cross-Cutting Concepts

Energy drives the cycling of matter within and between systems.

Energy and Matter

Transfer Goals

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 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.

Students also develop possible solutions for major global problems. They begin by breaking these problems into smaller problems that can be tackled with engineering methods. To evaluate potential solutions, students are expected not only to consider a wide range of criteria, but also to recognize that criteria need to be prioritized

Essential Questions

- How do ancient carbon atoms drive economic decisions in the modern world?
- How do we measure heat transfer?
- How do we measure heat?
- How is energy transferred in a chemical reaction?

- What is energy?

Understandings

- • 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.
- • Although energy cannot be destroyed, it can be converted into less useful forms—for example, to thermal energy in the surrounding environment.
- • Analysis of costs and benefits is a critical aspect of decisions about technology.
- • Science and technology may raise ethical issues for which science, by itself, does not provide answers and solutions.
- • 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.
- • 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.

Knowledge

- • Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.
- • Engineers continuously modify design solutions to increase benefits while decreasing costs and risks.
- • Many decisions are made not using science alone, but instead relying on social and cultural contexts to resolve issues.
- • Models can be used to simulate systems and interactions, including energy, matter, and information flows, within and between systems at different scales.
- • 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.
- • Uncontrolled systems always move toward more stable states—that is, toward a more uniform energy distribution.

Skills

- • Consider the limitations of the precision of the data collected and refine the design accordingly
- • Design an investigation to produce data on transfer of thermal energy in a closed system that can serve as a basis for evidence of uniform energy distribution among components of a system when two components of different temperatures are combined, considering types, how much, and the accuracy of data needed to produce reliable measurements.
- • Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost benefit ratios, scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g., economic, societal, environmental, and ethical

considerations).

- • Plan and conduct an investigation individually or collaboratively to produce data on transfer of thermal energy in a closed system that can serve as a basis for evidence of uniform energy distribution among components of a system when two components of different temperatures are combined.
- • Use models to describe a system and define its boundaries, initial conditions, inputs, and outputs.
- • Use models to evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost–benefit ratios, scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g., economic, societal, environmental, and ethical considerations).

Technology Integration and Differentiated Instruction

Technology Integration

● **Resources**

- Google Classroom and Microsoft OneNote- Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
- Additional resources including but not limited to, Bozeman Science videos, Crash Course Chemistry lessons and instructional videos by Tyler DeWitt enable students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

● **One to One Student's laptop**

- All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

- ❏ All assignments have been created in the student's native language.
- ❏ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❏ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❏ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❏ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

MATH - Use mathematical models (graphs, equations) .

SOCIAL STUDIES – Discuss advances in science and the impact they have on society.

WORLD LANGUAGES - Explore the etymology of chemistry-related terms to gain an understanding of their meaning and relationships and other terms. Include topic-related articles within lessons.

VISUAL/PERFORMING ARTS – Prepare and present multimedia presentations.

APPLIED TECHNOLOGY - Use on-line tools to evaluate various standards.

BUSINESS EDUCATION -

GLOBAL AWARENESS – Discuss global impact of diverse contributions to chemistry.

Stage 2 - Assessment

Performance Tasks

- Lab - Calorimetry of Metal lab
- Lab- Calorimetry of wax
- Plastic, stryafoam and paper cup comparison project

Other Evidence

What are the formative and summative evaluations used for this task?

- Cup project
- Formative assessment - unit test
- Practice Problems
- Textbook problems

Stage 3 - Learning Plan

Unit 3: Energy in Chemical Systems

(Holt Chapter 16, Honors Chapter 8)

Use Textbook (Holt: Modern Chemistry) as basis of lectures and notes.

- Modifications: Give written notes as reqested to students with accomidations and/or lower level learners.

<u>Suggested differentiated Activities:</u>

- Modifications: Multiple DI activities used to reach all levels of learners, such as but not limited to, vocabulary carousel, give one - get one, vocabulary scavenger hunt, Frayer model, vocabulary ladders, jig saw, and picture walks.

Heat webquest

Practice Calorimetry Problems

Applicable worksheets

Virtual Lab - Food Chemistry

ThermoChenistry Webquest

Vocabulary Scavenger Hunt

POGIL Calorimetry

PBL: Cup Analysis

Why Cold Doesn't Exist reading

Specific Heat Practice Worksheet

Reading - Stovetops for Darfur

Suggested Labs:

Calorimetry of Wax

Heat Transfer Lab

Honors:

The above with the following suggestions added:

PHET simulation

Hess's Law

Textbook Problems

Modifications

- Special Education:
    - Modify unit assessments by adding word banks, enlarging text, visual aids, highlighted directions, etc.
    - Provide highlighted notes and readings when necessary
    - Assign cooperative learning projects/assignments in which the groups are heterogeneously mixed by ability level/learning style.
    - Student created graphic organizers

        - Differentiated activities/review
        - Project based assessments/Portfolios
        - Utilize technology

    - Gifted Students:
        - Gifted students may create their own learning plan that allows the student to further investigate a topic of interest and/or advance a specific skill.
        - Students may be provided with more advanced texts.
        - Enrichment questions.

CP Chemistry:

Week 1: Chapter 2 -

Significant Figures Inquiry Activity
Lecture on significant figures

Give one – Get one Significant Figures
Video – Bozeman Science significant Figures

Dealing with Numbers worksheet
Sig fig worksheet

Significant Figures QUIZ

Week 2: Chapter 16 -

Lab: Calorimetry
Video – endothermic vs. exothermic
Unit 2 Lecture 1- Heat theory
Unit 2 Worksheet 1 – applying information from the lecture
Unit 2 Worksheet 2

Mini-lab
Unit 2 Lecture 2

Unit 2 Worksheet 3 – ODDS – practice Enthalpy problems
Video on Enthalpy
Unit 2 Worksheet 4 – Practice with vocabulary and problems

Unit 2 Lecture 3 - Calorimetry

Week 3: Chapter 16 -
Unit 2 Worksheet 5 – calorimetry problems
Unit 2 Worksheet 6 – Calorimetry problems
Video Calorimetry

Unit 2 Worksheet 7 – vocabulary and practice problems
Unit 2 Worksheet 8 - applications

Unit 2 Worksheet 9 – Applications

Week 4: Chapter 16 -
Unit 2 Worksheet 10 - Explore

Heat Web Quest
Virtual lab- Food Chemistry
Review sheet for Unit 2
Unit 3 TEST

Honors Chemistry:

Week 1: Chapter 8 -

Vocabulary Scavenger Hunt
Video – endothermic and exothermic

Lab – Simulation
Worksheet to be filled out using certain websites.
POGIL – Calorimetry
Page 233 #2, 10, 14

Week 2: Chapter 8 -
Lecture 1
Page 234 # 7,8,9
worksheet with websites

Page 234 # 17, 19, 23
Lab- Calorimetry – FORMAL
Page 235 #32 and 33
Lecture 2 – Hess's Law

Worksheet – Hess's Law
Video on standard enthalpy of formation

Week 3: Chapter 8 -
Page 236 # 41 and 42
Lecture 3

Page 236 # 54 & 56
Review chapter 8
Lab – Endothermic and exothermic reactions
Chapter 8 TEST

- add Item #1
- add item #2

Chem Unit #4: Chemical Rates and Equilibrium

Content Area: **Science**
Course(s): **CP CHEMISTRY, HON CHEMISTRY**
Time Period: **Marking Period 4**
Length: **20 days**
Status: **Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.2	Analyze factors that influence the emotional and social impact of mental health illness on the family.
SCI.HS.PS1.B	Chemical Reactions
SCI.HS.ESS3.D	Global Climate Change
SCI.HS.ETS1.C	Optimizing the Design Solution
SCI.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.
SCI.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.
TECH.9.4.12.CT	Critical Thinking and Problem-solving
	Emphasis is on the application of Le Chatelier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products.
	Stability and Change
	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.
	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.
	Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.
	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.
	Current models predict that, although future regional climate changes will be complex and

varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere.

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.

Patterns

Constructing explanations and designing solutions in 9–12 builds on K–8 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

Develop a model based on evidence to illustrate the relationships between systems or between components of a system.

Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Constructing Explanations and Designing Solutions

Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (tradeoffs) may be needed.

Energy and Matter

Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.

Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible.

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Constructing explanations and designing solutions in 9–12 builds on K–8 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.

Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.

A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart.

Analyze data using computational models in order to make valid and reliable scientific claims.

Science and Engineering Practices

SCI.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.

Constructing explanations and designing solutions in 9–12 builds on K–8 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Develop a model based on evidence to illustrate the relationships between systems or between components of a system.

Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Constructing Explanations and Designing Solutions

Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects.

Developing and Using Models

Disciplinary Core Ideas

SCI.HS.PS1.B	Chemical Reactions
SCI.HS.PS2.B	Types of Interactions
SCI.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.

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.

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.

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.

Cross Cutting Concepts

Stability and Change

Patterns

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.

Much of science deals with constructing explanations of how things change and how they remain stable.

Transfer Goals

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.

Understandings

- • As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another.
- • As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.
- • Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within a system.
- • Sugar molecules contain carbon, hydrogen, and oxygen: Their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells.

Knowledge

- • As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.
- • Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.
- • Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems.

Skills

- • Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large, carbon-based molecules.
- • Construct and revise an explanation, based on valid and reliable evidence from a variety of sources (including models, theories, simulations, peer review) and on the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future, for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large, carbon based molecules.
- • Use evidence from models and simulations to support explanations for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other

large, carbon-based molecules.

Essential Questions

What factors affect the rate of a reaction?

How can we manipulate a reaction?

Technology Integration and Differentiated Instruction

Technology Integration

● **Resources**

- Google Classroom and Microsoft OneNote- Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
- Additional resources including but not limited to, Bozeman Science videos, Crash Course Chemistry lessons and instructional videos by Tyler DeWitt enable students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

● **One to One Student's laptop**

- All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

- ❏ All assignments have been created in the student's native language.
- ❏ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❏ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❏ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❏ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Instruction

MATH - Use mathematical models (graphs, equations) .

SOCIAL STUDIES – Discuss advances in science and the impact they have on society.

WORLD LANGUAGES - Explore the etymology of chemistry-related terms to gain an understanding of their meaning and relationships and other terms. Include topic-related articles within lessons.

VISUAL/PERFORMING ARTS – Prepare and present multimedia presentations.

APPLIED TECHNOLOGY - Use on-line tools to evaluate various standards.

BUSINESS EDUCATION -

GLOBAL AWARENESS – Discuss global impact of diverse contributions to chemistry.

Stage 2

Performance Tasks

Lab - Iodine Clock Reaction

Lab - LeChatelier's Principle

Lab- Solubility Inquiry Lab

Lab - Plop Plop Fizz fizz

Students will write their own lab. They will test the rates of dissolving based on the factrs of temperature, stirring and surface area.

- Lab to be determined

Other Evidence

- Quiz
- Textbook problems
- Warm ups
- Worksheets

Stage 3 - Learning Plan

Unit 3: Interactions with Matter

(Holt Chapters 17, 18 - Honors Chapters 11 and 12) - Rates and Equilibrium

Use Textbook (Holt: Modern Chenmistry) as basis of lectures and notes.

- Modifications: Give written notes as reqested to students with accomidations and/or lower level learners.

Suggested Differentiated Activities:

- Modifications: Multiple DI activities used to reach all levels of learners, such as but not limited to, vocabulary carousel, give one - get one, vocabulary scavenger hunt, Frayer model, vocabulary ladders, jig saw, and picture walks.

Applicable worksheets

PHET Simulation: Reaction Rates

Reading: Sugar an unusal explosive

PHET Simulation: reversible Reactions

Equiibrium Bean Activity

POGIL: Equilibrium

Reading: What's so equal about equilibrium?

Equilibrium Game

POGIL - LeChatelier's Principle

Reading: The Haber Process

POGILS Collision Theory

Reaction Rate Worksheet

Suggersted Labs:

Micro-lab: Reaction rates and time

Lab - Iodine Clock Reactioj

Lab - Lechatelier's Principle

Lab- Solubility Inquiry Lab

Lab - Plop Plop Fizz fizz

Students will write their own lab. They will test the rates of dissolving based on the factrs of temperature, stirring and surface area.

SSNC Rates Lab

Reaction Rates Lab

Honors:

All of the above, and...

Calculations of Rate Expressions

Calculations of Equilibrium Constants

Modifications

- Special Education:

    - Modify unit assessments by adding word banks, enlarging text, visual aids, highlighted directions, etc.
    - Provide highlighted notes and readings when necessary
    - Assign cooperative learning projects/assignments in which the groups are heterogeneously mixed by ability level/learning style.
    - Student created graphic organizers
    - Differentiated activities/review
    - Project based assessments/Portfolios
    - Utilize technology

  - Gifted Students:

    - Gifted students may create their own learning plan that allows the student to further investigate a topic of interest and/or advance a specific skill.
    - Students may be provided with more advanced text.

CP Chemistry:

Week 1: Chapter 17 -

POGIL – Collision theory
Unit Lecture 1
Micro-lab
Reaction rates and time
Unit 3b Lecture 2
Discuss micro lab
Video - Factors of reaction rates
Reading: Sugar explosion
Video – Factors of reaction rates
Mini-lab – Alka-Seltzer

Week 2: Chapter 18 -
Lecture 3
Equilibrium Bean Activity
Video - Equilibrium
POGIL – Equilibrium
Reading: What’s so equal about equilibrium

Week 3: Chapter 18 -

Equilibrium game
Lecture 4
POGIL – LeChatelier’s Principle

Haber Process simulation
Review Sheet Unit
Unit TEST

Honors Chemistry:

Week 1: Chapter 11 -

Videos – Rates of reactions and orders
Lecture 1 - 11.1 and 11.2
Problems page 332
Textbook problems # 1, 5, 6, 16, 17 and 22
Problems #24, 25, 26
Lecture 2 (11.3)Use table from text page 313
Problems 34, 44, 46
Lab - Iodine Clock Reactions
Problems #36 and 45

Week 2: Chapter 11 -
Groupwork Practice (only #1-9)
Lecture 3 (11.4 and 11.5)
Page 336 # 47, 48, 59
Page 336 #52, 53, 54
Lecture 4 (11.6)
Page 336 #60, 61, 64
Lab - Simulation of rates
Chapter 11 TEST

Week 3: Chapter 8 -
POGIL – Equilibrium
Chapter 12 Lecture 1
Reading: What's so equal about equilibrium
Textbook problems page 336 #7,14,17,20 and 23
Lecture 2
Lab: LeChatelier's Principle

Week 4: Chapter 8 -
Group work problems - # 25, 27, 29
Videos – LeChatelier's principle
Problems #43 and 45
Chapter 12 TEST

- Scavenger Hunt
- Vocabulary ladder

Chem Unit #5: Nuclear Chemistry

Content Area: **Science**
Course(s): **CP CHEMISTRY, HON CHEMISTRY**
Time Period: **Marking Period 4**
Length: **30 days**
Status: **Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.SSH.1	Analyze the influences of peers, family, media, social norms and culture on the expression of gender, sexual orientation, and identity.
HE.9-12.2.1.12.SSH.2	Advocate for school and community policies and programs that promote dignity and respect for people of all genders, gender expressions, gender identities, and sexual orientations.
SCI.HS.PS1.C	Nuclear Processes
SCI.HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change).
SCI.HS-ESS1-6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth’s formation and early history.
SCI.HS-ESS3	Earth and Human Activity
SCI.HS-PS1	Matter and Its Interactions
TECH.9.4.12.CT	Critical Thinking and Problem-solving
	Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials.
	In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.
	Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process.
	Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation.
	Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.

Science and Engineering Practices

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.

Developing and Using Models

Develop a model based on evidence to illustrate the relationships between systems or between components of a system.

Disciplinary Core Ideas

SCI.HS.PS1.C	Nuclear Processes Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.

Cross Cutting Concepts

In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.

Energy and Matter

Transfer Goals

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.

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.

Understandings

- • 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.
- • In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.
- • Much of science deals with constructing explanations of how things change and how they remain stable.
- • Science and engineering complement each other in the cycle known as research and

development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise.

- • Science assumes the universe is a vast single system in which basic laws are consistent.
- • 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.
- • 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 total number of neutrons plus protons does not change in any nuclear process

Knowledge

- • 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.
- • Energy cannot be created or destroyed, only moved between one place and another place, between objects and/or fields, or between systems.
- • Nuclear fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation.
- • Nuclear processes, including fusion, fission, and radioactive decay of unstable nuclei, involve release or absorption of energy.
- • Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials.

Skills

- • Communicate scientific ideas about how in nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.
- • Communicate scientific ideas about the way nucleosynthesis, and therefore the different elements it creates, vary as a function of the mass of a star and the stage of its lifetime.
- • Communicate scientific ideas in multiple formats (including orally, graphically, textually, and mathematically) about the way stars, over their life cycles, produce elements.
- • Construct an explanation based on valid and reliable evidence that energy in the universe cannot be created or destroyed, only moved between one place and another place, between objects and/or fields, or between systems.
- • Develop a model based on evidence to illustrate the relationships between nuclear fusion in the sun's core and radiation that reaches Earth.
- • Develop models based on evidence to 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.
- • Use simple qualitative models based on evidence to illustrate the scale of energy released in nuclear processes relative to other kinds of transformations.

Essential Questions

- Should the US build more nucler power plants?

- What are nuclear reactions?
- What is nuclear power?

Technology Integration and Differentiated Instruction

Technology Integration

● **Resources**

- Google Classroom and Microsoft OneNote- Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
- Additional resources including but not limited to, Bozeman Science videos, Crash Course Chemistry lessons and instructional videos by Tyler DeWitt enable students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

● **One to One Student's laptop**

- All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❑ All assignments have been created in the student’s native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❑ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❑ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

MATH - Use mathematical models (graphs, equations) .

SOCIAL STUDIES – Discuss advances in science and the impact they have on society.

WORLD LANGUAGES - Explore the etymology of chemistry-related terms to gain an understanding of their meaning and relationships and other terms. Include topic-related articles within lessons.

VISUAL/PERFORMING ARTS – Prepare and present multimedia presentations.

APPLIED TECHNOLOGY - Use on-line tools to evaluate various standards.

BUSINESS EDUCATION -

GLOBAL AWARENESS – Discuss global impact of diverse contributions to chemistry.

Stage 2 - Assessment

Performance Tasks

- PHET - Nuclear Fission

- PHET - Nuclear Fusion
- PHET - Radioactive Decay
- Paper on pros or cons of nuclear energy

Other Evidence

- Homework check
- Unit Test
- Warm Ups
- Worksheets

Stage 3 - Learning Plan

Unit 5: Nuclear Chemistry

(Holt Chapters 21 - Honors Chapter 2)

Use Textbook (Holt: Modern Chenmistry) as basis of lectures and notes.

- Modifications: Give written notes as reqested to students with accomidations and/or lower level learners.

Suggest Differentiated Activities:

- Modifications: Multiple DI activities used to reach all levels of learners, such as but not limited to, vocabulary carousel, give one - get one, vocabulary scavenger hunt, Frayer model, vocabulary ladders, jig saw, and picture walks.

Applicable worksheets

PHET Sumulation: Alpha Decay

PHET Simulation: Beta Decay

REading: Nucler Power, a Clean and Safe source of Energy

Calculate your annual radiation exposure

Physics Fundamental Movies with worksheet - 1501 and 1502

Radioactive Decay Chain

Essay - the pros and cons of nuclear energy

- modification - individualized research

Videos - 3 Mile Island, Chernobyl

Movie- Inside Japan's Nuclear Meltdown with worksheet of questions

Reading - ChemMatters Nuclear Fusion- The next energy frontier?

Suggested Labs:

PHET Simulation: Half Life

PHET Smimulation: Nuclear Fission

Honors:

All of the above and:

Balancing Nuclear Equations

Modifications

- Special Education:
  - Modify unit assessments by adding word banks, enlarging text, visual aids, highlighted directions, etc.
  - Provide highlighted notes and readings when necessary
  - Assign cooperative learning projects/assignments in which the groups are heterogeneously mixed by ability level/learning style.
  - Student created graphic organizers
  - Differentiated activities/review
  - Project based assessments/Portfolios
  - Utilize technology
- Gifted Students:
  - Gifted students may create their own learning plan that allows the student to further investigate a topic of interest and/or advance a specific skill.

- Students may be provided with more advanced culturally authentic texts.

CP Chemistry

Week 1: Chapter 21 -

PHET – Alpha Decay
Lecture 1 – Radioactive Decay
PHET – Beta Decay
Balancing Reactions Worksheet 1
Balancing Reactions worksheet 2
Video – How to balance nuclear equations by organic chem tutor
POGIL – Balancing Nuclear Reaction Equations
Lecture 2 – Half Life and Decay Series
Physics Fundamentals video with worksheet
Video – Bozeman Science – Half Life and Radioactive Decay

Week 2: Chapter 21 -

Half Life Activity
Decay Chain Activity
Videos – DeWitt Half Life and TedEd video how X-rays can see through your skin
Lecture 3 – Radiation exposure and applications
Annual Radiation Exposure
TedEd video – Is radiation dangerous
Video – How does Radiation sickness work?
PHET – Radioactive Dating
Lecture 4 – Nuclear Fission and Fusion
POGIL – Nuclear Fission and Fusion
Bozeman Science – Nuclear Processes
PHET – Nuclear Fission

Week 3: Chapter 21 -
Review sheet
TEST
Intro to essay
Videos – pros and cons of nuclear power
Work on Essay
Video - Chernobyl
Video – 3 Mile Island

Week 4: Chapter 21 -
Peer review of Essay
Introduce debate
Prepare for debate
Debate

Honors Chemistry

Week 1: Chapter 2 -

PHET – Alpha Decay
Lecture 1 – Radioactive Decay
PHET – Beta Decay
Balancing Reactions Worksheet 1
Balancing Reactions worksheet 2
Video – How to balance nuclear equations by organic chem tutor
POGIL – Balancing Nuclear Reaction Equations
Lecture 2 – Half Life and Decay Series
Physics Fundamentals video with worksheet
Video – Bozeman Science – Half Life and Radioactive Decay

Week 2: Chapter 2 -

Half Life Activity
Decay Chain Activity
Videos – DeWitt Half Life and TedEd video how X-rays can see through your skin
Lecture 3 – Radiation exposure and applications
Annual Radiation Exposure
TedEd video – Is radiation dangerous
Video – How does Radiation sickness work?
PHET – Radioactive Dating
Lecture 4 – Nuclear Fission and Fusion
POGIL – Nuclear Fission and Fusion
Bozeman Science – Nuclear Processes
PHET – Nuclear Fission

Week 3: Chapter 2 -
Review sheet
TEST
Intro to essay
Videos – pros and cons of nuclear power
Work on Essay
Video - Chernobyl
Video – 3 Mile Island

Week 4: Chapter 2 -
Peer review of Essay
Introduce debate
Prepare for debate
Debate

- Individualized research

Chem Unit #6: The Chemistry in our World

Content Area: **Generic Content Area**
Course(s): **CP CHEMISTRY, HON CHEMISTRY**
Time Period: **Generic Time Period**
Length: **30 days**
Status: **Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
SCI.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
SCI.HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
TECH.9.4.12.CT	Critical Thinking and Problem-solving
TECH.9.4.12.GCA	Global and Cultural Awareness
TECH.9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.

Science and Engineering Practices

Constructing explanations and designing solutions 9–12 builds on K – experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles and theories.

Analyze complex real-world problems by specifying criteria and constraints for successful solutions.

Constructing Explanations and Designing Solutions

Asking Questions and Defining Problems

Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Disciplinary Core Ideas

SCI.HS.ETS1.A	Defining and Delimiting Engineering Problems
SCI.HS.ETS1.B	Developing Possible Solutions
	Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.
	When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.

Cross Cutting Concepts

Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Cause and Effect

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.

Feedback (negative or positive) can stabilize or destabilize a system.

Much of science deals with constructing explanations of how things change and how they remain stable.

Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible.

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.

Energy and Matter

Systems can be designed to cause a desired effect.

Systems and System Models

Models (e.g., physical, mathematical, computer models)can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.

Cause and Effect

Stability and Change

Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.

Patterns

Stability and Change

Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).

Scale, Proportion, and Quantity

Assessment does not include deriving mathematical equations to make comparisons.

Systems and System Models

Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Cause and Effect

Energy cannot be created or destroyed—only moved between one place and another place, between objects and/or fields, or between systems.

Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.

Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.

The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.

Transfer Goals

In this unit of study, students use *cause and effect* to *develop models and explanations* for the ways that feedbacks among different Earth systems control the appearance of Earth's surface. Central to this is the tension between internal systems, which are largely responsible for creating land at Earth's surface (e.g., volcanism and mountain building), and the sun-driven surface systems that tear down the land through weathering and erosion. Students begin to examine the ways that human activities cause feedbacks that create changes to other systems. Students understand the *system interactions* that control weather and climate, with a major emphasis on the mechanisms and implications of climate change. Students model the flow of energy and matter between different components of the weather system and how this affects chemical cycles such as the carbon cycle. Engineering and technology figure prominently here, as students use mathematical thinking and the analysis of geoscience data to examine and construct solutions to the many challenges facing long-term human sustainability on Earth. Here students will use these geoscience data to explain climate change over a wide range of timescales, including over one to ten years: large volcanic eruption, ocean circulation; ten to hundreds of years: changes in human activity, ocean circulation, solar output; tens of thousands to hundreds of thousands of years: changes to Earth's orbit and the orientation of its axis; and tens of millions to hundreds of millions of years: long-term changes in atmospheric composition).

Understandings

- • Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.
- • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
- • Science arguments are strengthened by multiple lines of evidence supporting a single explanation.
- • The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.
- • The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles.
- • The total amount of energy and matter in closed systems is conserved.

Knowledge

- Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.
- • Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes.
- • Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.
- • The total amount of carbon cycling among and between the hydrosphere, atmosphere, geosphere, and biosphere is conserved.

Skills

- • Develop a model based on evidence to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
- • Develop a model based on evidence to illustrate the biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere, providing the foundation for living organisms.
- • Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
- • Use empirical evidence to differentiate between how variations in the flow of energy into and out of Earth's systems result in climate changes.
- • Use multiple lines of evidence to support how variations in the flow of energy into and out of Earth's systems result in climate changes.

Essential Questions

- How do Earth's geochemical processes and human activities affect each other?

Technology Integration and Differentiated Instruction

Technology Integration

● **Resources**

- Google Classroom and Microsoft OneNote- Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
- Additional resources including but not limited to, Bozeman Science videos, Crash Course Chemistry lessons and instructional videos by Tyler DeWitt enable students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

● **One to One Student's laptop**

- All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❑ All assignments have been created in the student's native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❑ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❑ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

MATH - Use mathematical models (graphs, equations) .

SOCIAL STUDIES – Discuss advances in science and the impact they have on society.

WORLD LANGUAGES - Explore the etymology of chemistry-related terms to gain an understanding of their meaning and relationships and other terms. Include topic-related articles within lessons.

VISUAL/PERFORMING ARTS – Prepare and present multimedia presentations.

APPLIED TECHNOLOGY - Use on-line tools to evaluate various standards.

BUSINESS EDUCATION -

GLOBAL AWARENESS – Discuss global impact of diverse contributions to chemistry.

Stage 2 - Assessment

Performance Tasks

- Design a solution to a complex real-world problem
- Evaluate a solution to a complex real-world problem
- Use a computer simulation to model the impact of proposed solutions to a complex real-world problem

Other Evidence

- Benchmark checks in designs
- Quiz
- Warm ups

Stage 3 - Learning Plan

Suggested Differentiated Activities:

Engineering Design Project - students design a new invention that will help humanity

Plastics Project - Students take on an interest group and research that angle

Plastiscs project suggested assignments:

Plastics in our Lives

Charagter Info

Article Review

Gleup Lab

Opposition Research

Science of Plastics

Engineering Design Project Suggested Assignements:

Reading - Stovetops for Darfur

Reading - Bus Showers for the Homeless

Rading - Cleaning Poop from water

Determine the problem

Background Research

Draw your model

Build a prototype

Test prototype

Redesign prototype

Write a conclusion

Write and abstract

Construct a poster presentation of all ideas\

Modifications

- Special Education:
  - Modify unit assessments by adding word banks, enlarging text, visual aids, highlighted directions, etc.
  - Provide highlighted notes and readings when necessary
  - Assign cooperative learning projects/assignments in which the groups are heterogeneously mixed by ability level/learning style.
  - Student created graphic organizers
  - Differentiated activities/review
  - Project based assessments/Portfolios
  - Utilize technology
- Gifted Students:
  - Gifted students may create their own learning plan that allows the student to further investigate a topic of interest and/or advance a specific skill.
  - Students may be provided with more advanced culturally authentic texts.

Engineering Design Project:

Honors & CP Chemistry

Week 1:
Define a Problem
Write the problem statement
Background research with cost analysis
Specify requirements
Development work

Week 2:
Build a prototype
Write procedure and materials needed for your prototype
Test prototype

Interpret results
Redesign prototype
Test again

Week 3:

Interpret results
Compare with original
Graphs/ charts and pictures
Conclusion
Write an abstract (summary)

Week 4:

Put project together – print and cut and paste all parts
Presentations

Conflicts in Chemistry: Plastics PBL:

Week 1

Introduction

Plastics in our Lives

Character Information Analysis and Essay

Week 2

Article Review

Gluep Lab

Opposition Research Analysis and Essay

Week 3

Science of Plastics

Initial Group Presentation

Week 4

Public Hearing Debate

Revising a Government Regulation

Adapting the most suitable regulation

- Individualized research
- Students choose their own real world problem