Washington Township School District

The mission of the Washington Township Public Schools *is to provide a safe, positive, and progressive educational environment that provides opportunity for all students to attain the knowledge and skills specified in the NJ Learning Standards at all grade levels, so as to ensure their full participation in an ever-changing world as responsible, self-directed and civic-minded citizens.*

Course Title:	**College Preparatory Chemistry**
Grade Level(s):	10-12

Duration:	*Full Year:*	**x**	*Semester:*		*Marking Period:*	

Course Description:

This course is intended for students who have an interest in chemistry and who intend to continue their education beyond high school. There is a weekly double period lab in order to hone the students' laboratory and safety skills. Major topics of study include: atomic and molecular theory, periodic law, formula writing, nomenclature and writing balanced equations, gas laws solutions and reactions, acid-base chemistry and chemical equilibrium. The course requires mathematical application skills and emphasizes the use of the student's algebraic skills.

Grading Procedures:

Marking Period Grades		Year End Course Grade	
Tests	45%	Marking Period 1	20%
Quizzes	15%	Marking Period 2	20%
Lab Work	20%	Marking Period 3	20%
Independent work	10%	Marking Period 4	20%
Projects	10%	Midterm/Final Exam	10% **EACH**

Primary Resources:

NJ Model Curriculum for HS Chemistry

Next Generation Science Standards NGSS

New Jersey Student Learning Standards NJSLS

Text: Basic Chemistry 5th Edition

Author: Timberlake and Timberlake

Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21st century skills for College and Career Readiness in a global society

Designed by:	John Basile and Beth McIlvaine

Under the Direction of:	Dr. Patricia Hughes

Written: _____

Revised: _____

BOE Approval: _____

Unit 1: The Atom, The Periodic Table, and Laboratory

Unit Description:

The Atom and The Periodic Table

-This unit includes the origin of the elements, basic atomic structure, and radioactivity.

Laboratory Practices

- This unit is introduced in the beginning of the academic year and continues throughout the entire course. It deals specifically with the requirement and skills of the laboratory, lab notebook set up including lab documentation protocol, lab safety, and the lab report.

Unit Duration: 5 weeks (Laboratory Practices are ongoing)

Desired Results

Standard(s):

HS-PS1-1: Atomic Theory/ Structure

HS- PS1-8: Nuclear Processes

Indicators:

PS1.A Structure and Properties of Matter

PS1.C: Nuclear Processes

Understandings:

Students will understand that…

The Atom and The Periodic Table

1. All atoms have atomic structure that individually defines their identity and chemical reactivity.
2. A particular atomic structure can result in an unstable nucleus that emits radiation, including particles to achieve greater stability.
3. The predictability of atoms interacting to form different compounds depends on the electron structure of each atom.
4. Within the atom protons and neutrons interact according to the certain fundamental sources to determine its atomic structure.
5. Molar mass can help to determine the empirical formula.

Laboratory Practices

1. Proper laboratory technique is applied to various equipment in the lab to prevent injury.
2. Safety hazards are unique to each experiment, and the laboratory in general.
3. Specified behaviors are expected in the Laboratory.
4. The laboratory notebook has a specified protocol format to maintain integrity of the documentation.

Essential Questions:

The Atom and The Periodic Table

1. What makes an atom unique?
2. Does radiation occur naturally in atoms?
3. What are the fundamental forces that effect the atom?
4. What parts of the atom interact with each other?
5. What is the importance of calculating and using atomic and molecular molar mass?

Laboratory Practices

1. What are some of the dangerous situations that could develop in the laboratory environment?
2. Where are new developments in technology, medicine, and science being discovered?
3. What is the importance of recording detail and using lab documentation protocol in a laboratory notebook?
4. What would happen if there was no efficient way for scientists to share their discoveries?

Assessment Evidence

Performance Task:

Students will be able to…

The Atom and The Periodic Table

1. List and describe the 3 subatomic particles.
2. Define nuclear force.
3. Define ion and isotope.
4. Define and calculate average atomic mass.
5. List the order, scientist and experiments that lead to the discovery of the three subatomic particle.
6. Describe and list chronologically the events leading to the discovery of radioactivity.
7. List the three forms of natural radiation.
8. List and describe common radioactive elements.
9. Define Half-Life.
10. Discover and describe applications of radioactivity.
11. Explain arrangement of the periodic table.
12. Calculate molar mass.
13. Calculate empirical formula and molecular formula.

Laboratory Practices

1. Identify and display proper use of safety equipment in the laboratory.
2. Identify the safety hazards unique to each experiment, and the laboratory in general.
3. List the behaviors that a responsible student in a chemistry laboratory must follow.
4. Read and understand the safety contract and procure a parent or guardian signature.
5. Set-up the laboratory notebook using the proper format.
6. Document laboratory experiments using specific skills.
7. Write formal laboratory reports.
8. Manage a laboratory team.
9. Verify that all members of the team know the proper use of each piece of equipment.
10. Plan and execute a guided experiment.

Other Evidence:

1. Project (Minimum one per marking period) Suggestions: Mole Day and Science Novel Project
2. Quizzes
   - -Elements
   - -Chapters 4, 16, and 7
3. Independent work
   - -Elements
   - -Atomic Structure
   - -Atomic Number/ Mass
   - -Isotopes/Average Atomic Mass
   - -Nuclear Particles
   - -Nuclear Reactions
4. Lab
   - - Introduction to Laboratory
   - - Half-Life: Determining and Graphing the Half-Life of M&Mium
   - - Physical and Chemical Changes
   - - Rutherford's Experiment Lab (Simulation)

Benchmarks: Lab Notebook Setup and Chapters 4, 16, & 7 Test

Learning Plan

Learning Activities:

1. Review lab safety
2. View: MULTIMEDIA: "Accident at Jefferson High" Available in IMC
3. Worksheet and lab quiz on lab safety and multimedia video.
4. Setup lab notebook.
5. Prelab/ Lab: Introduction and Tutorial
6. Distribute atomic theory and structure notes/ View: MULTIMEDIA Bill Nye- Atoms Available in IMC 539.7 Atom
7. 4.1 questions and problems "Elements and Symbols" p. 106
8. 4.2 questions and problems "The Periodic Table" p. 111-112
9. 4.3 questions and problems "The Atom" p. 115
10. Lab- Rutherford's Experiment Lab (Simulation)

11. 4.4 questions and problems “Atomic and Mass Number” 118
12. Lab- Physical and Chemical Changes
13. Teacher generated worksheets for student independent work
14. Quiz on 4.1-4.4
15. Distribute nuclear chemistry notes/ View: MULTIMEDIA “Chernobyl Nuclear Disaster” Available in IMC 363.17
16. 4.5 questions and problems “Isotopes and Atomic Mass” p. 122
17. Textbook Follow up activities with applications p. 122 "Improving Crop Production"
18. 16.1 questions and problems “Natural Radioactivity” p. 527
19. 16.2 questions and problems “Nuclear Reactions” p. 534
20. 16.4 questions and problems “Half-Life of Radioisotope” p. 541
21. Lab- Half-Life: Determining and Graphing the Half-Life of M&Mium
22. 16.6 questions and problems “Nuclear Fission and Fusion” p. 548
23. Quiz on 16.1-16.4, 16.6
24. Textbook Follow up activities with applications p 549 "Cardiac Imaging using a Radioisotope"
25. Distribute mole concept and molar mass notes
26. 7.1 questions and problems “The Mole” p. 198-199
27. 7.2 questions and problems “Molar Mass” p. 201
28. 7.3 questions and problems “Calculations Using Molar Mass” p. 205
29. Quiz on 7.1-7.3
30. 7.4 questions and problems “Mass Percent Composition” p. 207
31. 7.5 questions and problems “Empirical Formulas” p. 212
32. 7.6 questions and problems “Molecular Formulas” 214-215
33. Textbook Follow up activities with applications p 215 " Two Prescriptions for Max"
34. Quiz on 7.4-7.6
35. Teacher generated worksheets and unit review to fit students need
36. Unit 1 Test

Resources:

1.Textbook, Basic Chemistry, Chapters 4 (pp. 102-130), 7 (pp. 194-223), and 16 (pp. 523-557)

Unit 1 Learning Goal and Scale

(Level 2.0 reflects a minimal level of proficiency)

Standard(s): 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.

4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • 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. • Hypothesize the identity of an unknown element given known information.
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, atom, electron, proton, neutron, atomic mass, atomic number, molecule, element, nucleus, electron cloud, orbital. • Classify the subatomic particles with regards to charge, size, and purpose. • Distinguish elements based of their atomic number, mass, and symbol
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard(s): HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

4.0	**Students will be able to:**

	• In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. • Hypothesize the identity of an unknown element within a nuclear reaction. • Describe the processes of fission, fusion, alpha, beta, and gamma radioactive decay.
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, isotope, emission, decay, positron, alpha, beta, gamma, fusion, fission, nuclear reaction, radioactive, radioactive decay, half-life, spontaneous decay, transformation, nuclear force)
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and applications of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic etc.)
English Language Learners	Translation of notes in their native language. http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:

Embedded English Language Arts/Literacy and Mathematics Standards
English Language Arts/Literacy
RST.11-12.1, Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
WHST.9-12.2, Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.9-12.5, Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-12.7, 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.
WHST.11-12.8, Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.9-12.9, Draw evidence from informational texts to support analysis, reflection, and research.
SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.

HSN-Q.A.1,Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 2: Electron Configurations, Spectroscopy, and Periodic Law

Unit Description: This unit includes quantum theory, drawing orbital diagrams, the configurations of electrons, the wavelength and frequencies of photons, and trends of the Periodic Table.

Unit Duration: 5 weeks

Desired Results

Standard(s):

HS-PS1-1: Orbital Diagrams, Periodic Trends, Metals/ Nonmetals

HS-PS4-3: Electromagnetic Radiation

HS-PS4-4: Light, Spectra, Radiation

HS-PS4-1: Wave Properties

Indicators:

PS1.A: Structure and Properties of Matter

PS4.A: Wave Properties

PS4.B: Electromagnetic Radiation

Understandings:
Students will understand that…

1. Properties of light are also known as electromagnetic radiation.
2. Light is used to further the understanding of the arrangement of electrons.

Essential Questions:

1. How are elements arranged on the periodic table?
2. What are the energy trends of the periodic table?
3. Why is light the most important tool to identify elements?
4. How is spectroscopy used to identify elements?
5. What are the properties of waves?

3. The arrangement of electrons impacts the atom's properties.
4. Atoms interact with light energy to reveal the arrangement of their electrons and subsequent energy levels around the nucleus.
5. Waves have specific properties that give rise to different phenomena in the universe.
6. Particles have a wave-particle duality.
7. The periodic table is arranged by trends in groups/ families and energy levels.

6. How are the properties related to one another?

Assessment Evidence

Performance Tasks:
Students will be able to…
1. Describe the electromagnetic and visible light spectrums.
2. List chronologically and describe the 4 models of the atom.
3. Explain wave-particle duality.
4. Explain arrangement of the periodic table ex: Names/ groups.
5. List and define the 4 quantum numbers
6. Write electron configurations
7. Draw Lewis dot structures.
8. List and explain common periodic trends.
9. Describe the chemical and physical differences between metals and nonmetals.
10. Label oxidation numbers on the periodic table.

Other Evidence:

1. Project (Minimum one per marking period) Suggestions: Mole Day and Science Novel Project

2. Quizzes

-Chapter 5 Quizzes (Periodic Trends, Orbital Diagrams, Electron Configurations, Quantum Theory)

3. Independent work

-Writing orbital diagrams

-Writing electron configurations

-Describing Quantum Theory

-Periodic Trends

4. Labs

-Flame Test

-L. E Mint (Investigation of periodic trends)

-Spectroscopy

-Electron Arrangement

-Periodic Law

Benchmarks: Lab Notebook Setup and Chapter 5 Test

Learning Plan

Learning Activities:

1. Distribute Electronic Structure and Periodic Trends notes/ View: MULTIMEDIA “Kaboom” Science of Fireworks
2. 5.3 questions and problems “Sub-levels and Orbitals” p. 142
3. Lab: Flame Test
4. 5.4 questions and problems “Orbital Diagrams and Electron Configurations” p. 146
5. Lab: Electron Arrangement
6. 5.5 questions and problems “Electron Configurations and the Periodic Table” p. 151
7. Quiz 5.3-5.5
8. Distribute Radiation, Spectroscopy, Periodic Law notes/ View: MULTIMEDIA “Mendeleev: Father of the Periodic Table” Available in the IMC 540.92 Men
9. Lab: Spectroscopy
10. 5.1 questions and problems “Electromagnetic Radiation” p. 135

11. 5.2 questions and problems “Atomic Spectra and Energy Levels” p. 138
12. Chemistry Link to the Environment “Energy-Saving Fluorescent Bulbs” pp. 137-138
13. 5.6 questions and problems “Trends in Periodic Properties” pp. 156-157
14. Lab: Periodic Law and L.E Mint
15. Textbook Follow up activities with applications p. 157 "Developing New Materials for Computer Chips"
16. Quiz on 5.1-5.2, 5.6
17. Teacher generated worksheets and unit review to fit students need
18. Unit 2 Test

Resources:
1.Textbook, Basic Chemistry, Chapters 5 (pp. 131-164)

Unit 2 Learning Goal and Scale
(Level 2.0 reflects a minimal level of proficiency)

Standard(s): 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.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. • Construct electron configurations based on orbital diagrams and vice versa. • Hypothesize the identity of an element based on given periodic trends and group information
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, octet rule, electron configuration, orbital diagram, Pauli Exclusion Principle, Uncertainty Principle, orbital shapes, quantum, ground state, excited state, quantum numbers, Aufbau Principle, Hund’s Rule, ionization energy, electronegativity, electron affinity, atomic radius, period law, group, period, group names) • Describe Pauli Exclusion Principle, Uncertainty Principle, Aufbau Principle, and Hund’s Rule • Classify elements by their group name • Compare elements based on the periodic trends
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard(s): HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, electromagnetic radiation, frequency, wavelength, amplitude, medium, properties of waves, speed, vacuum, wave, wave packet.) • Describe the relationship between, speed, energy, frequency, amplitude, and wavelength.

1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard(s): HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, electromagnetic, radiation, photoelectric effect, wave model, interference, duality) • Describe the wave/ particle duality of radiation.
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard(s): HS-PS4-4. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. • Differentiate between the different types of radiation and their corresponding damage to different substances. • Identify substances based on their spectrum emitted when given a known set of spectrums
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, absorb, damage, radiation, energy, frequency, infrared radiation, light, matter, photon, spectroscopy, line spectrum, emission spectrum, spectroscope.) • Recall claims about the effects of the different types of electromagnetic radiation when absorbed by matter. • Achieve satisfactory use of a spectroscope
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and applications of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic etc.)
English Language Learners	Translation of notes in their native language. http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
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WHST.9-12.5, Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-12.7, 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.
WHST.11-12.8, Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
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Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:

Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 3: Chemical Bonding and Nomenclature

Unit Description: This unit explores the relationship between the atomic structure of the atoms and the bonds they form. The relationship between bond type and physical and chemical characteristics of a compound are investigated. Nomenclature of compounds is described and utilized.

Unit Duration: 5 weeks

Desired Results

Standard(s):

HS-PS1-3: Bonding

HS-PS2-6: Formula Writing and Naming

Indicators:

PS2.B: Types of Interactions

PS1.A: Structure and Properties of Matter

Understandings:

Students will understand that…

1. If the atomic structure is known, bond type, and physical /chemical properties can be predicted.
2. The octet rule and the desire of all elements to have a stable outer level of electrons, drives bonding.
3. The electronegativity of an atom determines the type of chemical bond that is formed in a chemical reaction.
4. Bond type dictates chemical and physical properties, which leads to the extensive diversity of crystal solids, liquids and gas compounds.
5. Chemists have the ability to manipulate atoms and synthesize new compounds with desirable properties.
6. Chemical bonds store potential energy, dependent on the atoms involved, which dictates the bond strength and chemical reactivity.
7. The position of an element on the periodic table determines the charge of the ion to form, which allows a neutral ionic compound.

Essential Questions:

1. How are the atomic structure and the chemical properties of an atom related?
2. Why do atoms interact by chemical bonds?
3. What does the electronegativity of the atoms tell us about the chemical bond?
4. What happens when electrons in the bonds interact with each other?
5. What evidence is seen in everyday life that provides evidence that different types of chemical bonds exist?
6. What special chemical properties have chemists designed into various materials?
7. When chemical bonds are broken, what type of energy is released?
8. Which elements are likely to gain electrons? Lose electrons?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Define valence electrons.
2. Explain and diagram ion formation.
3. Define electronegativity and its impacts on ionic and covalent bonds.

Other Evidence:

1. Project (Minimum one per marking period Suggestions: Current Event Report and Element Debate
2. Quizzes

4. Explain difference between covalent, ionic and metallic bonds. 5. Define polar covalent. 6. Calculate electronegativity differences. 7. Describe how bonds hold and their energy. 8. Use the octet rule to determine the oxidation number of ions. 9. Use the criss-cross method to write chemical formulas 10. Name the major types of compounds. 11. Define and differentiate between different types of compounds.	-Chapter 6 Quizzes (Bonding, Formula Writing, Nomenclature) 3. Independent work -Electronegativity/ Bond type -Single, double, and triple bonds -Oxidation Numbers -How to properly name compounds using Criss Cross method -Roman Numeral Nomenclature -Polyatomic Nomenclature -Nomenclature using Prefixes 4. Labs - Molecular Models - Binary Compounds (2 lab periods) - Ionic versus Covalent - Metal Versus Nonmetal

Benchmarks: Lab Notebook Setup and Chapter 6 Test

Learning Plan

Learning Activities:

1. Distribute Bonding notes/ View: MULTIMEDIA: "Bonding and Atomic Structure" Bill Nye and MULTIMEDIA: “Chemical Bonds” Available in IMC 539.1 Che
2. Lab: Metal Versus Nonmetal
3. 6.1 questions and problems “Ions: Transfer of Electrons” p. 171
4. 6.2 questions and problems “Ionic Compounds” p. 174
5. Lab: Ionic versus Covalent
6. 6.5 questions and problems “Molecular Compounds: Sharing Electrons” pp. 186-187
7. Lab: Molecular Models
8. Textbook Follow up activities with applications p 187 "Compounds at the Pharmacy"
9. Quiz 6.1-6.2, 6.5
10. Lab: Binary Compounds (2 lab periods)
11. Distribute Naming and Writing Formula Notes
12. 6.3 questions and problems “Naming and Writing Ionic Formulas” pp. 178-179
13. 6.4 questions and problems “Polyatomic Ions” p. 183
14. Quiz on 6.3-6.4
15. Teacher generated worksheets and unit review to fit students need
16. Unit 3 Test

Resources:

1.Textbook, Basic Chemistry, Chapters 6 (pp. 165-193)

Unit 3 Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): 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.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • 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. • Investigate why substances look and act the way they do based on their type of bonding.
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, atom, ion, dipole, covalent, ionic, metallic, electron, charge, oxidation number, single bond, double bond, triple bond, molecule, compound, formula unit, attraction, repulsion, valence.) • Describe the process of bonding along with the interactions and forces that hold molecules together.
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard(s): HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. • Construct the names and formulas of various compounds based on nomenclature rules.
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, nomenclature, cation, anion, subscript, prefix, suffix, binary, monoatomic, diatomic, polyatomic)
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and applications of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic etc.)
English Language Learners	Translation of notes in their native language.

	http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:
Embedded English Language Arts/Literacy and Mathematics Standards
English Language Arts/Literacy
RST.11-12.1, Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
WHST.9-12.2, Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.9-12.5, Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-12.7, 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.
WHST.11-12.8, Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.9-12.9, Draw evidence from informational texts to support analysis, reflection, and research.
SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 4: Molecular Structure and Diagrams

Unit Description: This unit depicts molecules and polyatomic ions via Lewis Dot configuration. Identification of polar chemical bonds and the attractive forces that hold molecules together in a pure substance and the effect of bonds and forces on the shapes of molecules are major topics.

Unit Duration: 5 weeks

Desired Results

Standard(s):

HS-PS1-3: Molecular Geometry, VSEPR Theory, Lewis Structures

Indicators:

PS1.A: Structure and Properties of Matter

Understandings:

Students will understand that…

1. Lewis structures are used to predict the shape of molecules.
2. The octet rule states that atoms will lose, gain, or share electrons so that each atom is surrounded by eight electrons.
3. Atoms form covalent bonds by sharing electrons
4. Shared electron pairs are represented by dashed lines, unshared pairs are represented by dots.
5. The shape of molecules is determined by the repulsion between electrons in chemical bonds and non-bonded valence electrons.
6. The VSEPR theory correctly predicts shapes of molecules.

Essential Questions:

1. How are Lewis structures drawn?
2. How are Lewis structures used to predict the shape of molecules?
3. What is the octet rule and how is it used to draw Lewis structures?
4. What are the various shapes of molecules?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Construct Lewis dot structures based off of valence electrons.
2. Describe VSEPR theory and how it relates to symmetry and polarity.
3. Describe the various molecular shapes and their polarities.
4. Demonstrate knowledge of symbols used in Lewis dot diagrams and what they represent.

Other Evidence:

1. Project (Minimum one per marking period) Suggestions: Current Event and Element Debate

2. Quizzes

-Chapter 10 Quizzes (Molecular Geometry, Lewis Structures, VSEPR Theory)

3. Independent work

-Polarity and Molecular shape recognition

-Constructing Lewis Structures

4. Labs

- Drawing Lewis Structures
- Polar versus Nonpolar Lab

Benchmarks: Lab Notebook Setup, Chapter 10 Test, Midterm Exam (assesses Units 1-4. Chapters 4, 5, 6, 7, 10, and 16 knowledge)

Learning Plan

Learning Activities:

1. Distribute Molecular Geometry notes
2. 10.1 questions and problems “Lewis Structures for Molecules and Polyatomic Ions” pp. 285-286
3. Lab: Drawing Lewis Structures
4. 10.3 questions and problems “Shapes of Molecules and Polyatomic Ions (VSEPR Theory)” p. 293
5. Quiz on 10.1 and 10.3
6. 10.4 questions and problems “Electronegativity and Bond Polarity” p. 296
7. 10.5 questions and problems “Polarity of Molecules” p. 298
8. Lab: Polar versus Nonpolar Lab
9. Textbook Follow up activities with applications p 309 "Histologist Stains tissue with Dye"
10. Quiz on 10.4-10.5
11. Teacher generated worksheets and unit review to fit students need
12. Unit 4 test
13. Midterm Review

Resources:

1.Textbook, Basic Chemistry, Chapter 10 (pp. 279-322)

Unit 4 Learning Goal and Scale

(Level 2.0 reflects a minimal level of proficiency)

Standard(s): 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.

4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • 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. • Investigating why substances look and act the way they do based on their molecular geometry and polarity. • Construct Lewis structures when having information on their valence electrons
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, valence electrons, ion, electronegativity, bond, polar, nonpolar, hybridization, VSEPR theory, polarity, symmetry, energy, Lewis structures, model, octet rule, molecular geometry, bond angle, bond energy.) • Describe specifics about the different types of molecular shapes • Describing a molecule’s polarity based on their geometry.
1.0	**With help, partial success at level 2.0 content and level 3.0 content**

0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and applications of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic etc.)
English Language Learners	Translation of notes in their native language. http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
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WHST.11-12.8, Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
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SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.

9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 5: Chemical Reactions and Stoichiometry

Unit Description: This unit is heavily concentrated on interpreting word problems, setting up and performing calculations and realizing the enormous information that is contained in a balanced chemical equation. The different types of chemical reactions are described in detail as well as knowing how to write and balance them.

Unit Duration: 6 weeks

Desired Results

Standard(s):

HS-PS1-2: Writing and Balancing Equations, Predicting Products, Types of Reactions

HS-PS1-7: Stoichiometry (Mass and Energy Relations Within Chemical Equations)

Indicators:

PS1.A: Structure and Properties of Matter

PS1.B: Chemical Reactions

Understandings:
Students will understand that…

1. The mole is a number that allows chemists to count incredibly small atoms, ions, and molecules by weighing and defining in terms of grams per mole.
2. Stoichiometry uses the Law of Conservation of Mass-Energy and the mole to predict quantitatively the amounts in a chemical reaction in terms of mass, volume, number of particles and energy.
3. Every chemical reaction involves a change in energy, which results from the difference in the potential energy of the chemical bonds in the reactants and products, this energy can be measured and used in stoichiometric calculations.
4. When given starting quantities of reactants, a balanced chemical equation can be used to determine the limiting reactant.
5. The percent yield of a chemical reaction compares the actual amount of product produced in the laboratory with the theoretical yield of a stoichiometric calculations.
6. The conservation of matter is demonstrated by balancing properly written chemical equations.
7. Products can be predicted by utilizing the activity series.
8. Types of reactions can be determined by the examination of the reactants and products in a chemical equation.
9. Different types of chemical reactions are demonstrated daily in everyday life.

Essential Questions:

1. Why do chemists need to use the mole?
2. What can a Stoichiometry problem tell you?
3. How does energy relate to Stoichiometry?
4. What do we need to know to determine the limiting reactant?
5. What does percent yield mean?
6. What are the different types of reactions?
7. How are coefficients used to balance a chemical equation?
8. How can one predict the product of a single or double displacement reaction?
9. How are correctly written formulas used to assist in writing chemical equations?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Define Stoichiometry.
2. Calculate Molar Mass.
3. Covert from Moles to Grams, Volume, Atoms and all metric units.
4. Solve Mass-Mass, Mass-Volume, Mass- Particle type Stoichiometry problems.
5. Solve Mass-Energy type Stoichiometry problems.
6. Solve limiting reactant type Stoichiometry problems.
7. Solve percent yield type Stoichiometry problems.
8. Identify and or label various chemical equations by type.
9. Construct chemical equations and use coefficients to balance them.
10. Predict products using the activity series.

Other Evidence:

1. Project (Minimum one per marking period) Suggestions: Career Research and 20-Sided Shape: Chemical Research

2. Quizzes

-Chapter 8 Quizzes (Writing/Balancing Equations, Predicting Products, and Types of Reactions)

-Chapter 9 Quizzes (Mass-Mass Stoichiometry, Mass-Mole Stoichiometry, Mole-Mole Stoichiometry)

3. Independent work

-Mole-Mole/ Mass-Mole/Mass-Mass Stoichiometry

-Writing products and reactants

-Writing full equations

-Balancing equations using coefficients

-Predicting products using the activity series

4. Lab

- Bubbles and Bangs (Synthesis and Decomposition Reactions)

- Types of Reaction

- Hydrates

-Simple Stoichiometry

- Mole Zoo

-Alchemy: Copper to Gold

Benchmarks: Lab Notebook Setup and Chapters 8, 9 Test

Learning Plan

Learning Activities:

1. Distribute Chemical Reactions notes/ View: MULTIMEDIA: “Chemical Reactions”- Bill Nye Available in IMC 541.34 CHE
2. 8.1 questions and problems “Equations for Chemical Reactions” p. 228
3. Lab: Types of Chemical Reactions
4. Distribute Balancing Chemical notes
5. Quiz 8.1
6. 8.2 questions and problems “Balancing a Chemical Equation” pp. 233-234
7. Quiz 8.2
8. Distribute Types of Chemical Reactions notes
9. 8.3 questions and problems “Types of Chemical Reactions” p. 239
10. Lab: Bubbles and Bangs
11. Quiz 8.3
12. Predicting products using activity series notes

13. Teacher generated worksheets and material for predicting products
14. Lab: Alchemy: Copper to Gold
15. Textbook Follow up activities with applications p 242 "Improving Natalie's Overall Fitness",
16. Quiz on predicting products
17. Distribute Conservation of Mass notes/ View: MULTIMEDIA: “The Amazing Mole” Available in IMC 541 Ama
18. 9.1 questions and problems “Conservation of Mass” p. 252
19. Lab: Hydrates
20. 9.2 questions and problems “Calculating Moles Using Mole-Mole Factors” pp. 254-255
21. Lab: Simple Stoichiometry
22. 9.3 questions and problems “Mass Calculations for Reactions” p. 258
23. Lab: Mole Zoo
24. Quiz 9.1-9.3
25. 9.4 questions and problem “Limiting Reactants” p. 262
26. 9.5 questions and problems “Percent Yield” p. 265
27. Textbook Follow up activities with applications p 271 "Testing Water Samples for Pesticides"
28. Teacher generated worksheets and unit review to fit students need
29. Unit 5 test

Apply demonstrations as appropriate for types of reactions:
1. Demo Synthesis: Calcium and Sulfur
2. Demo Decomposition: Hydrogen peroxide with Sodium iodide
3. Demo Combustion: Methane filled bubbles
4. Demo Single Replacement: Copper and silver nitrate
5. Demo Double Replacement: Lead (II) nitrate and Sodium iodide

Resources:
1. Textbook, Basic Chemistry, Chapters 8 (pp. 224-248) and 9 (pp. 249-278)

Unit 5 Learning Goal and Scale
(Level 2.0 reflects a minimal level of proficiency)

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

4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties • Predict the products of chemical reactions using knowledge of reaction types and properties of elements. • Formulate and balance chemical equations so that the law of conservation of matter is demonstrated.
2.	**Students will be able to:** • Recognize or recall specific vocabulary (for example, reactant, product, chemical equation, chemical reaction, yield, subscript, superscript, coefficient, single displacement, double displacement, combustion, synthesis, decomposition, activity series, reactivity, formula equation, word equation.) • Describe the different types of reactions • Describe the parts of a chemical equation and their symbols
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard(s): HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction • Calculate the moles of an unknown substance when provided moles of a given substance in a balanced chemical equation. • Calculate the moles of an unknown substance when provided mass of a given substance in a balanced chemical equation. Calculate the mass of an unknown substance when provided mass of a given substance in a balanced chemical equation.
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, atom, atomic mass, molar mass, mole, gram, mass, conserve, product, reactant, energy, percent yield, actual yield, theoretical yield, limiting reactant, excess reactant, mole ratio, stoichiometry.)
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and applications of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic etc.)
English Language Learners	Translation of notes in their native language. http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
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Interdisciplinary Connections

Indicators:

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audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
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Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
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CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 6: Thermodynamics and Equilibrium

Unit Description: This unit will explore the energy involved in chemical reactions. Specific heat, final temperature, and enthalpy will all be investigated. Hess's Law, heat of fusion, heat of vaporization will be calculated. The unit will conclude with an application of the impact of such in relation climate change.

Unit Duration: 5 weeks

Desired Results

Standard(s):

HS-PS1-5: Collision Theory and Rate Influencing Factors

HS-PS1-6: Reaction Rates and Equilibrium

HS-PS3-4: Energy, Specific Heat, Energy Diagrams

HS-ESS2-4: Climate Change

Indicators:

PS1.B: Chemical Reactions

PS3.B: Conservation of Energy and Energy Transfer

PS3.D: Energy in Chemical Processes
ESS2.A: Earth Materials and Systems

Understandings:

Students will understand that…

1. The flow of energy through matter is a transfer of kinetic energy from the collisions of particles of matter, and can be represented in mathematical equations.
2. Enthalpy is the measure of how much energy has been transferred during a chemical reaction.
3. Entropy is the measure of the amount of randomness in a system.
4. Every compound absorbs and releases energy at specific rate.
5. The enthalpies of different chemical equations, which lead to an overall reaction can be summed to find the final heat of formation.
6. Le Chatelier's Principle correctly predicts how a reaction will shift when subjected to different stress.
7. Chemical reactions are the result of colliding molecules with the right force and orientation.
8. Chemical reaction rates are influenced by several factors.
9. Energy transfer in and out of Earth's system results in changes of climate.

Essential Questions:

1. What is heat?
2. What is specific heat?
3. How is enthalpy calculated and what information does it provide about a chemical reaction?
4. Can enthalpies be added?
5. What is entropy?
6. What influences the rate of reaction?
7. How is Le Chatelier's Principle used to describe changes in equilibrium?
8. How is climate change related to the energy flow in and out of Earth's systems?
9. What does the Collision Theory describe about reacting molecules?

Assessment Evidence

Performance Tasks:

Students will be able to…

1. Describe the Laws of Thermodynamics.
2. Define absolute zero.
3. Describe the Kelvin temperature scale.
4. Define specific heat.
5. Perform specific heat calculations.
6. Define CALORIE vs calorie.
7. Perform enthalpy of fusion, vaporization and combustion calculations.
8. Describe Gibbs Free Energy Equation.
9. Recall the rate influencing factors.
10. Relate all information covered on energy and heat transfer to the effect it has on climate change.
11. Describe Le Chatelier's Principle in detail and how it causes reactions to shift.
12. Recall collision theory and its rules.
13. Describe the relationship between energy transfer and climate change.

Other Evidence:

1. Project (Minimum one per marking period) Suggestions: Career Research and 20-Sided Shape: Chemical Research

2. Quizzes

   -Chapter 13 Quizzes (Reaction Rates, Equilibrium, Collision Theory, Rate Influencing Factors)

   -Chapter 3 and 9 Quizzes (Energy and Energy Diagrams)

3. Independent work

   -Using balanced equations to use Le Chatlier's Principle

   -Writing rate law

   -Drawing energy diagrams

   -Describing energy diagrams

   -Calculating Specific heat

4. Lab

   - Vernier™ Chemistry with computers #1: Endothermic and Exothermic Reactions

   - Vernier™ Chemistry with Computers #18: Additivity of Heat Reaction; Hess' Law

   - Vernier™ Chemistry with Computers #20: Chemical Equilibrium/ Finding an Equilibrium Constant

   - Determining the Specific Heat of Metals

Benchmarks: Lab Notebook Setup and Chapters 3, 9, and 13 Test

Learning Plan

Learning Activities:

1. Distribute Energy, Reactions Rates, and Equilibrium notes/ View: MULTIMEDIA: “An Inconvenient Truth” Available in IMC DVD Inc
2. 3.3 questions and problems “Temperature” p. 81/ View: MULTIMEDIA: “Absolute Zero: Changing the Ultimate Freezing Point Available in IMC 536.56 Abs
3. Chemistry Link to Health: Variation in Body Temperature p. 81
4. 3.4 questions and problems “Energy” p. 84
5. Lab: Vernier™ Chemistry with computers #1: Endothermic and Exothermic Reactions
6. Chemistry Link to the Environment: Carbon Dioxide and Climate Change p. 84
7. Quiz 3.3-3.4
8. Lab: Vernier™ Chemistry with Computers #18: Additivity of Heat Reaction; Hess’ Law
9. 9.6 questions and problems “Energy in Chemical Reactions” p. 270
10. Chemistry Link to Health: Cold Packs and Hot Packs
11. 3.5 questions and problems “Specific Heat” p. 88
12. Lab: Determining the Specific Heat of Metals
13. Quiz 3.5, 9.6
14. 13.1 questions and problems “Rates of Reactions” p. 415/ View: MULTIMEDIA: “Reaction Kinetics” Available in IMC 541.3 Rea
15. Chemistry Link to the Environment: Catalytic Convertors p. 414-415
16. 13.2 questions and problems “Chemical Equilibrium” p. 418
17. 13.3 questions and equilibrium “Equilibrium Constants” p. 422
18. 13.5 questions and problems “Changing Equilibrium Conditions: Le Chatelier’s Principle” p. 431-432
19. Lab: Vernier™ Chemistry with Computers #20: Chemical Equilibrium/ Finding an Equilibrium Constant
20. Quiz 13.2-13.3, 13.5
21. Chemistry Link to Health: Homeostasis: Regulation of Body Temperature p. 431
22. Textbook Follow up activities with applications p. 435 "Equilibrium of CO_2 in the Ocean"
23. Teacher generated worksheets and unit review to fit students need
24. Unit 6 Test

Resources:

1.Textbook, Basic Chemistry, Chapters 3 (pp. 69-101), 9 (pp. 249-278), and 13 (pp. 409-442**)**

Unit 6 Learning Goal and Scale

(Level 2.0 reflects a minimal level of proficiency)

Standard(s): 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.

4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:**

	• 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. • Construct an Reaction Energy Graph and label all of its constituents • Describe the Rate Law Equation
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, Collison theory, thermodynamics, orientation, energy, force, elastic, kinetics, reaction rate, mechanism, catalyst, intermediate, rate influencing factors, activation energy, change in energy, rate law.) • Describe actions that can be done to change the rate of a reaction • Describe Collision Theory
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard(s): 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.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium • Construct an Equilibrium Expression when given a chemical equation
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, equilibrium, reversible, reactants, products, Le Chatelier's Principle, pressure, temperature, concentration, exothermic, endothermic.) • Predict whether a chemical reaction will shift to the product or reactant side using Le Chatelier's Principle. • Describe the different "stresses" one can impose on a chemical reaction according to Le Chatelier's Principle
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard(s): 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).	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). • Calculate an unknown variable of the specific heat equation

2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, reaction, energy, thermochemistry, calorimeter, temperature, kelvin, Celsius, heat, joule, calorie, fahrenheit, absolute zero, heat of formation, specific heat, mass, variable, Gibbs, enthalpy, entropy, chaos, spontaneous, exothermic, endothermic, Hess' Law.) • Describe the difference between heat and temperature • Describe the Gibbs Free Energy Equation variables • Describe Hess' Law
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard(s): HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, global warming, climate, heat, greenhouse effect, biosphere, Earth system, ice volume, sea level, solar, timescale.) • Describe the flow of energy in and out of Earth systems • Describe the relationship between energy in Earth systems and changes in climate • Describe how changes in climate may occur over different lengths of time
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and applications of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic etc.)
English Language Learners	Translation of notes in their native language. http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:

	• Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:
Embedded English Language Arts/Literacy and Mathematics Standards
English Language Arts/Literacy
RST.11-12.1, Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
WHST.9-12.2, Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.9-12.5, Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-12.7, 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.
WHST.11-12.8, Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.9-12.9, Draw evidence from informational texts to support analysis, reflection, and research.
SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 7: Interactions of Matter and the Gas Laws

Unit Description: This unit includes the investigation of intermolecular forces between molecules and how forces effect a substance's phase. It also investigates the differences between solids/liquids and gases. The Gas Laws are an integral unit content topic.

Unit Duration: 4 weeks

Desired Results

Standard(s):

HS-PS1-3: States of Matter, Intermolecular Forces

HS-PS3-2: Gas Laws

Indicators:

PS3.A: Definitions of Energy

PS1.A: Structure and Properties of Matter

PS2.B: Types of Interactions

Understandings:

Students will understand that…

1. The states of matter are a consequence of the intermolecular forces.
2. The different types of intermolecular forces act. differently depending on the substance and the elements involved.
3. Intermolecular forces are dependent upon molecular polarity and symmetry.
4. Gases are significantly different from solids and liquids.
5. Gases can be described using all of the gas laws.
6. Pressure, volume, temperature, and moles can all be related using the gas laws.

Essential Questions:

1. What are the different types of intermolecular forces?
2. How do the intermolecular forces influence how substances act?
3. Why do the states of matter look and act the way they do?
4. How are gases significantly different from solids/liquids?
5. What are the gas law relationships between pressure, volume, moles, and temperature?

Assessment Evidence

Performance Tasks: *Students will be able to…* 1.Define the nature of gas state. 4.Define, write and use the Boyle's Law equation. 5.Define, write and use the Charles's Law equation. 6.Define, write, and use the Gay-Lussac's Law equation. 7.Define, write, and use the Dalton's Law equation. 8.Define, write and use the Combined Gas Law equation. 9.Define, write and use the Graham's Law equation. 10.Define, write and use the Ideal Gas Law equation. 11.Define Intermolecular Force, Dipole-Dipole, Hydrogen bonding, and London Dispersion. 12. Define the states of matter and how they interact with each other regarding the intermolecular forces.	**Other Evidence:** 1.Project (Minimum one per marking period) Suggestions: Science Fair (Demo Day) and Alternate Energy Research 2. Quizzes -Chapter 10 Quizzes (States of matter and Intermolecular Forces) -Chapter 11 Quizzes (Gas Laws) 3. Independent work -Interactions between molecules -How the states of matter behave and look -Calculating Pressure, Volume, Moles, and Temperature 4. Lab - Gas Mystery (Boyles and Charles Law) - Cohesion and Adhesion - Dry Ice Lab (Change of State) - Ideal Gas Law and Stoichiometry - Vernier™ Chemistry with Computers #6: Boyle's Law: Pressure-Volume Relationship in Gases - Vernier™ Chemistry with Computers #7: Pressure-Temperature Relationship in Gases

Benchmarks: Lab Notebook Setup and Chapters 10, 11 Test

Learning Plan

Learning Activities:

1. Distribute Intermolecular Forces and States of Matter notes/ View: MULTIMEDIA: "Gases and States of Matter" Available in IMC 540 Gas
2. 10.6 questions and problems "Intermolecular Forces Between Atoms or Molecules" p. 301
3. 10.7 questions and problems "Changes in States" p. 309
4. Lab: Cohesion and Adhesion
5. Chemistry Link to Health: Steam Burns p. 309
6. Quiz 10.6-10.7
7. Lab: Dry Ice Lab
8. Distribute Gas Law notes
9. 11.1 questions and problems "Properties of Gas" p. 329
10. Chemistry Link to Health: Measuring Blood Pressure p. 327
11. 11.2 questions and problems "Pressure and Volume (Boyle's Law)" p. 332
12. Chemistry Link to Health: Pressure-Volume Relationship in Breathing p. 331
13. 11.3 questions and problems "Temperature and Volume (Charles' Law)" p. 334
14. 11.4 questions and problems "Temperature and Pressure (Gay-Lussac's Law)" p. 337
15. Lab: Gas Mystery
16. Quiz 11.1-11.4
17. 11.5 questions and problems "Combined Gas Laws" p. 339-340
18. 11.6 questions and problems "Volumes and Moles (Avogadro's Law)" p. 342
19. 11.7 questions and problems "Ideal Gas Law" p. 346
20. Lab: Ideal Gas Law and Stoichiometry
21. Quiz 11.5-11.7
22. 11.8 questions and problems "Gas Laws and Chemical Reactions" p. 348
23. 11.9 questions and problems "Partial Pressures" (Dalton's Law) p. 352
24. Chemistry Link to Health: Hyperbaric Chambers p. 352
25. Textbook Follow up activities with applications p. 353 "Exercise-Induced Asthma"
26. Quiz 11.8-11.9
27. Teacher generated worksheets and unit review to fit student needs
28. Unit 7 Test

Resources:

1.Textbook, Basic Chemistry, Chapters 10 (pp. 279-322) and 11 (pp. 323-359)

Unit 7 Learning Goal and Scale

(Level 2.0 reflects a minimal level of proficiency)

Standard(s): 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.

4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:**

	• 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.
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, atom, interactions, forces, attraction, repulsion, solid, liquid, gas, intermolecular, bond, electron, positive, negative, boiling, freezing, melting, sublimation, deposition, condensing evaporation, triple point, dipole, hydrogen bonding, London dispersion, adhesion, cohesion.) • Describe the relationship between electrical forces and the different states of matter • Describe the structure of various substances • Describe why the states of matter look and act the way they do
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard(s): HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields • Manipulate and substitute an unknown variable within Boyle's Law, Charles' Law, Gay-Lussac's Law, Ideal Gas Law, Dalton's Law, and Graham's Law. • Calculate moles and liters of a gas using the standard molar volume at STP • Compare both direct and inverse relationships among volume, pressure, temperature, and moles through gas law problem solving.
2.0	**Students will be able to:** • Recognize or recall specific vocabulary [for example, volatile, effusion, diffusion, Dalton's Law, Boyle's Law, Charles' Law, Gay-Lussacs' Law, Graham's Law, repulsion, attraction, temperature, pressure, volume, gas constant, moles, kelvin, liter, atmospheres, molar volume, Standard Temperature and Pressure (STP)]. • Convert units of pressure between torr, mmHg, atmospheres, and kilopascals • Convert Celsius to Kelvin temperatures • Describe how the properties of gases are different than liquids and solids.
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	Critical thinking problems and applications of skills presented.
Struggling Learners	Copy notes using fill in notes, collaborative learning activities, utilize all learning styles (visual, audio, kinesthetic etc.)
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Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

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CRP5 – Consider the environmental, social and economic impacts of decisions.
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CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.

Unit 8: Acid, Bases, and Solution Chemistry

Unit Description: This unit explores crucial chemistry content understanding: solutions. The dissolving process is explored and solution concentrations are calculated. Colligative properties are also discussed. The unit ends with acid and base chemistry to include: Buffers, pH, and neutralization reactions.

Unit Duration: 5 weeks

Desired Results

Standard(s):

HS-PS1-1: Acid and Base Chemistry

HS-PS1-3: Solution Chemistry

Indicators:

PS1.A: Structure and Properties of Matter

PS2.B: Types of Interactions

Understandings:

Students will understand that…

1. The chemistry of biological systems take place in solution form, usually with water as the solvent, and understanding the dissolving process is important for comprehending the biochemical environment.
2. Solutions vary in degree of concentration due to solubility of the solute, type of solvent and temperature of the solution.
3. Dissolving can occur only if some kind of attraction exists between the solute and solvent, if not the two substances will be physical mixed.
4. Changing the components of a solution affects the properties of that solution.
5. Acids and bases have a molecular structure that supports the function of proton donation or acceptance.
6. The molecular structure determines the ability of an acid or base to be strong and ionize completely, or be weak and ionize partially creating equilibrium.
7. The pH scale is built on the natural tendency of water to partially ionize and behave as a weak acid or a weak base.
8. Neutralization reactions involve one reactant acting as base in concert with another reactant acting as an acid, both due to their molecular structures.
9. Buffer systems are acid-base chemical equilibria that help maintain pH stability of a solution, vital to the survival of biological systems.

Essential Questions:

1. Does everything dissolve in water?
2. What is the mechanism of dissolving?
3. What does salt do when put on and icy road?
4. What is the different between an acid and a base?
5. What is the difference between a strong acid or base and a weak acid or base?
6. What does pH measure and what does it mean?
7. What happens when an acid reacts with a base?
8. Why are biological systems sensitive to changes in pH?
9. What are the different types of solutions?
10. How is concentration (molarity) calculated and what are the units?
11. What is the Tyndall Effect?

Assessment Evidence

Performance Tasks:

1.List the properties of solutions.
2.Describe how a solution is made.
3.List and describe the different types of solutions
4.Define and Calculate Molarity.
5.Describe vapor Pressure reduction.
6.Describe boiling point elevation.
7.Describe freezing point depression.
8.Describe a saturated solution.
9.List and explain the factors that affect dissolving.
10.Explain the three definitions of acids and bases.
11.Write conjugate acid-base pairs.
12.Define strong acid and base.
13.Define weak acid and base.
14.Define kA and kB.

Other Evidence:

1. Project (Minimum one per marking period) Suggestions: Science Fair (Demo Day) and Alternate Energy Research
2. Quizzes
   -Chapter 12 Quizzes (Solutions)
   -Chapter 14 Quizzes (Acids and Bases)
3. Independent work
   -Distinguishing between the types of solutions
   -Calculating Molarity
   -Calculating pH/ pOH

15.Define pH and pOH . 16.Calculate pH and pOH . 17.Describe the ionization of water. 18.Describe a neutralization reaction. 19.Describe and perform a titration. 20.Define indicator. 21.Describe and use a pH meter. 22.Define a salt. 23.Define buffer and describe how it works. 24.Describe the 4 buffer systems present in the blood.	-Distinguishing between the different types of Acids and Bases -Recognizing the Strong Acids and Bases 4. Labs - Molarity: Solutions of Tricherry Kooloxide -Vernier™ Chemistry with Computers #22: Acid Rain - Freezing Point Depression: Ice Cream - Titration - Litmus Paper

Benchmarks: Lab Notebook Setup, Chapters 12 and 14 Test, Final Exam (covering Units 5-8 and Chapters 3, 8, 9, 10, 11, 12, 13, and 14)

Learning Plan

Learning Activities:

1. Distribute Solution Chemistry notes
2. 12.1 questions and problems “Solutions” p. 364
3. Chemistry Link to Health: Water in the Body p. 363
4. 12.2 questions and problems “Electrolytes and Nonelectrolytes” p. 367
5. Chemistry Link to Health: Electrolytes in Body Fluids p. 367
6. 12.3 questions and problems “Solubility” p. 373
7. Chemistry Link to Health: “Gout and Kidney Stones: A Problem of Saturation in Body Fluids” p. 369
8. 12.4 questions and problems “Solution Concentrations” p. 381
9. Lab: Molarity: Solutions of Tricherry Kooloxide
10. Quiz 12.1-12.4
11. 12.5 questions and problems “Dilution of Solutions” p. 385
12. 12.7- Discussion on Colligative Properties
13. Lab: Freezing Point Depression: Ice Cream
14. 12.7 questions and problems p. 395
15. Quiz 12.5, 12.7
16. Distribute Acids and Bases notes/ View: MULTIMEDIA: “Acids, Bases, and Salts” Available in IMC DVD 546 Che
17. 14.1 questions and problems “Acids and Bases” p. 446
18. Lab: Vernier™ Chemistry with Computers #22: Acid Rain
19. 14.2 questions and problems “Bronsted-Lowry Acids and Bases” p. 449
20. 14.3 questions and problems “Strengths of Acids and Bases” p. 454
21. Quiz 14.1-14.3
22. 14.5 questions and problems “Dissociation of Water” p. 460
23. 14.6 questions and problems “pH scale” p. 467
24. Lab: Litmus Paper
25. Chemistry Link to Health: Stomach Acid, HCl p. 467
26. 14.7 questions and problems “Reactions of Acids and Bases” p. 470
27. Chemistry Link to Health: Antacids p. 470

28. 14.9 questions and problems “Buffers” p. 477/ View: MULTIMEDIA: “Buffer and Buffer Systems” Available in IMC 546 Buf
29. Chemistry Link to Health: Buffers in the Blood Plasma p. 476
30. Quiz 14.5-14.7, 14.9
31. Teacher generated worksheets and unit review to fit students need
32. Unit 8 Test
33. Final Exam Review

Resources:
1.Textbook, Basic Chemistry, Chapters 12 (pp. 360-408) and 14 (pp.443-490)

Unit 8 Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): 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.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • 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. • Differentiate between an Arrhenius, Lewis, and Bronsted-Lowry acids and bases • Identify a conjugate acid or base when given an acid-base reaction • Determine whether an amphoteric species will act as an acid or a base depending on what environment it is in. • Calculate pH and pOH
2.0	**Students will be able to:** • Recognize or recall specific vocabulary on Acids and Bases (for example, acid, base, indicators, reactivity, salts, electricity, binary, electronegativity, electrons, repulsion, attractive, strong acid/base, weak acid/base, Arrhenius, Lewis, Bronsted-Lowry, monoprotic, diprotic, triprotic, conjugate, amphoteric, neutralization, acid rain.) • Recognize or recall specific vocabulary on pH (for example, pH, pOH, self-ionization, K_w, titration, pH scale, equivalence point, end point, Buffered Solution, buffer.) • Describe a neutralization reaction • Describe how a buffer works
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Standard(s): 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	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • 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 • Differentiate between the different types of solutions and their properties.

	• Calculate molarity
2.0	**Students will be able to:** • Recognize or recall specific vocabulary (for example, mixture, homogenous, heterogenous, solution, colloid, suspension, solvent, solute, alloy, dissolve, dissociate, Tyndall effect, electrolyte, nonelectrolyte, rate, surface area, agitating, temperature, saturated, supersaturated, unsaturated, concentration, dilute, Molarity, colligative properties, freezing-point depression, boiling-point elevation, vapor-pressure reduction.)
1.0	**With help, partial success at level 2.0 content and level 3.0 content**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
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WHST.9-12.2, Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.9-12.5, Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-12.7, 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.
WHST.11-12.8, Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.9-12.9, Draw evidence from informational texts to support analysis, reflection, and research.
SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Mathematics
MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Integration of 21st Century Skills

Indicators:
Career Ready Practices
CRP2 – Apply appropriate academic and technical skills.
CRP5 – Consider the environmental, social and economic impacts of decisions.
CRP6 – Demonstrate creativity and innovation.
CRP7 – Employ valid and reliable research strategies.
CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them.
CRP10 – Plan education and career paths aligned to personal goals.
CRP11 – Use technology to enhance productivity.
CRP12 – Work productively in teams while using cultural global competence.
9.2 Career Awareness, Exploration, and Preparation
9.2.12.C.1 – Review career goals and determine steps necessary for attainment.
9.2.12.C.3 – Identify transferable career skills and design alternate career plans.