COURSE TITLE

Chemistry

LENGTH

Full Year

DEPARTMENT

STEM Department

SCHOOL

Rutherford High School

DATE

September 10, 2018

Initial BOE Approval Date (Born on): 6/15/2015

Chemistry

I. Introduction/Overview/Philosophy

Students in this course will develop an understanding of key concepts that help them make sense of chemical and physical based sciences. The ideas are building upon students' science understanding of disciplinary core ideas, science and engineering practices, and crosscutting concepts from earlier grades. There are five life science topics that will be addressed through this course: chemistry laboratory skills, the classification and structure of matter, ratio and proportion of chemical reactions, physical chemistry, acid-base chemistry, kinetics, thermodynamics, electrochemistry, and organic chemistry. Critical thinking (the ability to carry out systematic thought processes in making decisions and solving problems), inquiry (solving problems through scientific investigation) and science ethics are stressed in this class.

The performance expectations for high school chemistry blend core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge that can be applied across the science disciplines. While the performance expectations in high school chemistry couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices underlying the performance expectations. Through a variety of laboratory and hands-on activities, students will investigate areas of chemistry. The goal of the course is to instill in students the belief that chemistry is an exciting, relevant, and will apply to both their personal and professional futures.

II. Objectives

Course Outline:

A. Chemical Foundations
   a. Math Review
   b. Dimensional Analysis – Conversions
   c. Metric System & Measurements
   d. Classification of Matter
   e. Physical - Chemical Properties
   f. Physical - Chemical Change

B. Atomic Structure
   a. Components of the Nuclear Atom
   b. Atomic Number & Protons
   c. Mass Number & Neutrons
   d. Average Atomic Mass
   e. Isotopes & Percent Abundance

C. Electrons in Atoms
   a. The discovery of the electron.
   b. The arrangement of electrons.
   c. Electrons & chemical behavior
   d. Orbits & The Bohr Model
   e. The Modern View – Quantum Model and Orbitals.

D. Periodic Trends- Ionic Bonding

a. The Concept of Particle Charge.
b. Ions - Valance electrons.
c. Trends in Atomic Size, Energy & Electronegativity.
d. Opposites Attract! – The Ionic Bond
e. Formulas & Nomenclature
f. Properties of Ionic Compounds
g. Compounds of the d-block
h. Polyatomic Ions

E. Covalent Bonding
a. Sharing electrons vs. transferring.
b. The Relative Strength of Bonds
c. Covalent Compound Properties
d. Covalent Compound Nomenclature
e. Acids Nomenclature
f. The Bonding Process

F. Reactions, Energy, Equations
a. All reactions involve energy.
b. Energy is "stored" in chemical bonds.
c. Exothermic & Endothermic Reactions.
d. Thermochemistry & Calorimetry
e. Specific Heat
f. Thermal Equilibrium of system & surroundings.
g. Balanced Equations
h. Types of Reactions and Classification
i. Reaction outcome predictions
j. Redox Reactions

G. Stoichiometry
a. Mol-mol calculations
b. Mol-mass calculations
c. Mass-mass calculations
d. The Limiting Reactant
e. Percent yield

H. Chemical Equilbrium
a. Reactions
b. Le Chatelier's Principle

I. Kinetic Molecular Theory
a. Change of State: Solid – Liquid - Gas
b. Measuring Gases
c. The Behavior of Gases
d. Boyles Law
e. Charles's Law
f. Combined Gas Law
g. Ideal Gas Law
h. Gas stoichiometry

J. Solutions
a. The energetics of the Solution Process
b. Solutions Concentration - % by volume and Molarity.
c. Solution preparation and dilutions

K. Acids and Bases
    a. The auto-ionization of water
    b. Arrhenius definition of acids & bases
    c. The pH scale and the relative strength of acids and bases.
    d. Analysis of a strong acid and base in a neutralization reaction.
L. Biochemistry
    a. Macromolecules
    b. Carbs, Lipids, Proteins Nucleic Acids
    c. Photosynthesis – Energy Inputs & Outputs.
    d. Cellular Respiration – The reverse of photosynthesis.
    e. The manufacture of ATP in eukaryotic cells.
M. Nuclear Chemistry and Energy
    a. Nuclear reactions versus chemical reactions
    b. The process of fission vs fusion.
    c. Relative energy difference of chemical to nuclear processes.
    d. Radioactive decay and half-life.

Student Outcomes:

After successfully completing this course, the student will:

- Construct explanations for the role of energy in the cycling of matter in organisms and ecosystems
- Formulate answers to the question "how and why do organisms interact with each other (biotic factors) and their environment (abiotic factors), and what affects these interactions?" Secondary ideas include the interdependent relationships in ecosystems; dynamics of ecosystems; and functioning, resilience, and social interactions, including group behavior.
- Examine factors that have influenced the distribution and development of human society; these factors include climate, natural resource availability, and natural disasters. Students use computational representations to analyze how earth systems and their relationships are being modified by human activity.
- Utilize mathematical models to provide support for conceptual understanding of systems and students' ability to design, evaluate, and refine solutions for reducing the impact of human activities on the environment and maintaining biodiversity. Students will additionally create or revise a simulation to test solutions for mitigating adverse impacts of human activity on biodiversity.
- Investigate explanations for the structure and functions of cells as the basic unit of life, of hierarchical organization of interacting organ systems, and of the role of specialized cells for maintenance and growth.
- Analyze data and develop models to make sense of the relationship between DNA and chromosomes in the process of cellular division, which passes traits from one generation to the next. Students determine why individuals of the same species vary in how they look, function, and behave. Students explain the mechanisms of genetic inheritance and describe the environmental and genetic causes of gene mutation and the alteration of gene expressions.
- Develop an understanding of the factors causing natural selection of species over time. They will also demonstrate and understandings of how multiple lines of evidence contribute to the strength of scientific theories of natural selection.

- Evaluate evidence of the conditions that may result in new species and understand the role of genetic variation in natural selection. Students demonstrate an understanding of these concepts by obtaining, evaluating, and communicating information and constructing explanations and designing solutions.

New Jersey Student Learning Standards

CAREER READY PRACTICES

CRP1 Act as a responsible and contributing citizen and employee.

Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

CRP2 Apply appropriate academic and technical skills.

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation

CRP4 Communicate clearly and effectively and with reason.

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP5. Consider the environmental, social and economic impacts of decisions.

Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

CRP6. Demonstrate creativity and innovation.

Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP7. Employ valid and reliable research strategies.

Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP9. Model integrity, ethical leadership and effective management.
Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.

CRP10. Plan education and career paths-aligned to personal goals.
Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career patHS-require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.

CRP11. Use technology to enhance productivity.
Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

CRP12. Work productively in teams while using cultural global competence.
Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

TECHNOLOGY STANDARDS

Standard 8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Strand A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

8.1.12.A.4- Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
8.1.12.A.5- Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.

21ST CENTURY LIFE AND CAREERS

9.2 Career Awareness, Exploration, and Preparation

Strand C: Career Preparation

9.2.12.C.1 Review career goals and determine steps necessary for attainment.
9.2.12.C.2 Modify Personalized Student Learning Plans to support declared career goals.
9.2.12.C.3 Identify transferable career skills and design alternate career plans.

COMPANION STANDARDS FOR SCIENCE AND TECHNICAL SUBJECTS

RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
RST.9-10.5. Analyze the relationshiPSamong concepts in a text, including relationshiPSamong key terms (e.g., force, friction, reaction force, energy).
RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
WHST.9-10.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.9-10.6. Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
WHST.9-10.9. Draw evidence from informational texts to support analysis, reflection, and research.

NEW JERSEY STUDENT LEARNING STANDARDS- SCIENCE

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties
HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
HS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects
HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
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.
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 motion of particles (objects) and energy associated with the relative position of particles (objects).
HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
HS-PS3-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

III. Proficiency Levels

Chemistry is available to students who have completed Biology and one year of Algebra.

IV. Methods of Assessment

Student Assessment
The teacher will provide a variety of assessments during the course of the year. The assessment may include but is not limited to: chapter and unit tests and quizzes, simulations, lab reports, application problems, homework, and projects.

Curriculum/Teacher Assessment
The teacher will provide the subject area supervisor with suggestions for changes on an ongoing basis.

V. Grouping

There are no prerequisites for this course.

VI. Articulation/Scope & Sequence/Time Frame

Course length is one year.

VII. Resources

Texts/Supplemental Reading/References

Resources may include but are not limited to:

1. Text
2. Online Textbooks
    a. http://www.ck12.org/book/Chemistry---Second-Edition-%2528CA-DTI3%2529/

b. http://www.ck12.org/book/CK-12-Chemistry-Intermediate/

3. Workbook
   a. POGIL
4. Web-based Resources
   a. https://www.teachengineering.org/
   b. http://betterlesson.com/next_gen_science
   c. http://www.ck12.org/
   d. Discovery News: http://news.discovery.com/
   e. SciShow

VIII. Suggested Activities

Appropriate activities are listed below in the curriculum map.

IX. Methodologies

Chemistry is a laboratory science with class time spent on laboratory experiments and hands-on activities. Group instruction, cooperative learning, and individual projects are also utilized.

X. Interdisciplinary Connections

Daily connections are made with mathematics by using scientific notation in problem solving, conversion of units of measure, and numerous chemical formulas with mathematical solutions.

XI. Differentiating Instruction for Students with Special Needs: Students with Disabilities, Students at Risk, English Language Learners, and Gifted & Talented Students

Differentiating instruction is a flexible process that includes the planning and design of instruction, how that instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways as they celebrate students' prior knowledge. By providing appropriately challenging learning, teachers can maximize success for all students.

Differentiating in this course includes but is not limited to:

Differentiation for Support (ELL, Special Education, Students at Risk)

- Peer mentoring on problems
- Differentiated teacher feedback on assignments
- Modeling out problems on whiteboard
- Visual aids as we project problems on whiteboard
- Study guides
- Tiered assignments
- Scaffolding of materials and assignments
- Re-teaching and review
- Guided note taking

- Exemplars of varied performance levels
- Multi-media approach to accommodating various learning styles

Differentiation for Enrichment

- Supplemental reading material for independent study
- Flexible grouping
- Tiered assignments
- Topic selection by interest
- Enhanced expectations for independent study
- Elevated questioning techniques using Webb's Depth of Knowledge matrix

XII. Professional Development

The teacher will continue to improve expertise through participation in a variety of professional development opportunities.

XII. Curriculum Map/Pacing Guide

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
CHEMICAL FOUNDATIONS ● Math Review ● Dimensional Analysis – Conversions ● Metric System & Measurements ● Classification of Matter ● Physical - Chemical Properties ● Physical - Chemical Change	4 weeks	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed. *For Enhancement:* Thickness of Al Foil Activity Density & Measurement Lab	HS-PS1-3 HS-PS1-7 CRP1,4,6,7,8,9,11,12 9.2.12.C.1,2,3 RST.9-10.3,4,5	*Formative Assessment:* Homework – Group work on DA problems *Summative Assessment* Quiz on Metric Conversions & DA
ATOMIC STRUCTURE ● Components of the Nuclear Atom ● Atomic Number & Protons ● Mass Number & Neutrons ● Average Atomic Mass ● Isotopes & % Abundance	2 weeks	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed. *For Enhancement:* Phet Simulation- - **Build an Atom**	HS-PS1-8 HS-PS1-7 HS-PS3-5 HS-PS1-3 CRP1,4,6,7,8,9,11,12 WHST.9-10.2,6,9	*Formative Assessment:* Homework- Reading Notes Assigned Exercises Worksheets and group work in class. *Summative Assessment* Quarterly Benchmark Project on Development of Modern Atomic Theory
ELECTRONS IN ATOMS ● The "discovery" of the electron. ● The arrangement of electrons. ● Electrons & chemical behavior ● Orbits & The Bohr Model ● The Modern View – Quantum Model and Orbitals.	3 weeks	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed. *For Enhancement:*	HS-PS1-1 HS-PS2-6 HS-PS1-2 CRP1,4,6,7,8,9,11,12	*Formative Assessment:* Homework- Reading Notes Assigned Exercises Worksheets and group work in class.

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
		"Electron Configuration Battleship"		*Summative Assessment* Atomic Structure & electrons in atoms test. Quarterly Benchmark Project
PERIODIC TRENDS – IONIC BONDING ● The Concept of Particle Charge. ● Ions - Valance electrons. ● Trends in Atomic Size, Energy & Electronegativity. ● Opposites Attract! – The Ionic Bond ● Formulas & Nomenclature ● Properties of Ionic Compounds ● Compounds of the d-block ● Polyatomic Ions	3 weeks	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed. *For Enhancement:* Phet simulation on Coulomb's Law Periodic Trend Graphing w/Chromebook "Sweet 16" Ionic Naming & Masses activity.	HS-PS3-1 HS-PS3-5 HS-PS2-4 HS-PS2-6 CRP1,4,6,7,8,9,11,12 8.1.12.A.4 8.1.12.A.5 RST.9-10.7,9	*Formative Assessment:* Assigned text reading and problem solving. *Summative Assessment* Ionic Compound quiz – Formulas, Names and Molar masses Periodic Trends & Ions Test
COVALENT BONDING ● Sharing electrons vs. transferring. ● The Relative Strength of Bonds ● Covalent Compound Properties ● Covalent Compound Nomenclature ● Acids Nomenclature ● The Bonding Process – Molecule Polarity – HONC Rule – Lewis Structures.	3 weeks	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed. *For Enhancement:* Molecular Models Building Lab. Molecular vs. Ionic Compounds Lab	HS-PS1-2 HS-PS1-1 HS-PS2-6 CRP1,4,6,7,8,9,11,12	*Formative Assessment:* Assigned Reading and videos for "flipped" classes. *Summative Assessment* Quiz on Covalent and Acid compound nomenclature & formulas. Test on all aspects of chemical bonding
REACTIONS – ENERGY – EQUATIONS. ● All reactions involve energy. ● Energy is "stored" in chemical bonds. ● Exothermic & Endothermic Rxns. ● Thermochemistry & Calorimetry	6 weeks	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed.	HS-PS3-1 HS-PS3-2 HS-PS3-4 HS-PS1-4 HS-PS1-5 HS-PS1-6	*Formative Assessment:* Significant amount of classwork in the development of balanced chemical equations.

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
• Specific Heat – q=mCΔT • Thermal Equilibrium of system & surroundings. • Chemical Equations describe reactions • The BALANCED Equation is a must. • The translation of word equations to formula equations to BALANCED equations. • Types of Reactions and Classification • Reaction outcome predictions • Redox Reactions		*For Enhancement:* Specific Heat of Metals lab. Thermal Equilibrium Lab Bond Energy ***POGIL*** Redox Reactions and the Energy of Snack Foods.	HS-PS1-7 CRP1,4,6,7,8,9,11,12	*Summative Assessment* Calorimetry Problem solving Quiz. Reactions Prediction and equations Test.
STOICHIOMETRY What amounts do reactions produce? • The mole ratio concept and…. • Mol-mol calculations • Mol-mass calculations • Mass-mass calculations • The Limiting Reactant • Percent yield • Additional aspects of stoichiometric problems -	4 weeks	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed. *For Enhancement:* Determining Mole Ratios of Reactants by Job's Plot (method of continuous variation)	HS-PS1-7 HS-PS1-1 HS-PS3-1 CRP1,4,6,7,8,9,11,12	*Formative Assessment:* Significant problem solving requirement in class – group work. Substantial homework requirement. *Summative Assessment* Results of the Job's Plot Lab. Test on all aspects of reaction stoichiometry.
CHEMICAL EQUILBRIUM • Not all reactions go ------> • Many reactions are <--------> • Le Chatelier's Principle	1 week	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed. *For Enhancement:* Dueling Graduated Cylinders Activity.	HS-PS1-5 HS-PS3-4 HS-PS1-6 CRP1,4,6,7,8,9,11,12	*Formative Assessment:* Assigned reading notes on LeChatelier's Principle. *Summative Assessment* Quiz on Reaction stressors and system responses.

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
		Cobalt (II) chloride temperature and pH stress lab activity.		
KINETIC MOLECULAR THEORY ● Change of State: Solid – Liquid - Gas ● Measuring Gases ● The Behavior of Gases ● Boyles Law ● Charles's Law ● Combined Gas Law ● Ideal Gas Law ● Gas stoichiometry	2 weeks	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed. *For Enhancement:* Phet simulation – Behavior of Gases Crash Course Chem Video on KMT	HS-PS1-4 HS-PS1-3 HS-PS3-1 HS-PS3-2 HS-PS3-4 HS-PS1-5 CRP1,4,6,7,8,9,11,12 8.1.12.A.4 8.1.12.A.5	*Formative Assessment:* Homework exercises in gas law problem solving. *Summative Assessment:* Quiz and test on all aspects of KMT and gas law calculations
SOLUTIONS – INTERMOLECULAR FORCES ● The energetics of the Solution Process ● Solutions Concentration - % by volume and Molarity. ● Solution preparation and dilutions	3 weeks	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed. *For Enhancement:* Construction of energy diagrams for soluble ionic compounds. Phet simulation on Molarity and dilution Density & Concentration of an unknown solution lab.	HS-PS1-5 HS-PS1-7 HS-PS3-4 HS-PS3-1 HS-PS3-2 CRP1,4,6,7,8,9,11,12 RST.9-10.3,4,5	*Formative Assessment:* Homework exercises in solution concentrations – preparations and dilutions. *Summative Assessment:* Results derived from lab. Test and quizzes on solution energies, concentrations and dilutions.
ACIDS & BASES ● The auto-ionization of water ● Arrhenius definition of acids & bases ● The pH scale and the relative strength of acids and bases. ● Analysis of a strong acid and base in a neutralization reaction.	3 weeks	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed. *For Enhancement:* Titration of a Strong Acid and Base to	HS-PS1-2 HS-PS1-5 HS-PS1-6 HS-PS1-7 CRP1,4,6,7,8,9,11,12	*Formative Assessment:* Significant In-class work in problem solving of pH. pOH, [H+] and [OH-]. Result of titration lab – quality of the lab report. *Summative Assessment*

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
		determine an Unknown Molarity – Lab.		Quizzes and test on acid-base chemistry and pH calculations.
CONCEPTS OF BIOCHEMISTRY ● Macromolecules ● Carbs, Lipids, Proteins Nucleic Acids ● Photosynthesis – Energy Inputs & Outputs. ● Cellular Respiration – The reverse of photosynthesis. ● The manufacture of ATP in eukaryotic cells.	2 weeks	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed. *For Enhancement:* Research and Develop a model of the DNA molecule. (4th. Quarter Benchmark Project)	HS-PS2-6 HS-PS3-2 HS-LS 1-6 HS-LS 1-7 CRP1,4,6,7,8,9,11,12	*Formative Assessment:* Classwork, Homework on Concepts of Biochemistry *Summative Assessment* Quality of the DNA Model. Accuracy and thoroughness of DNA timeline research.
CONCEPTS OF NUCLEAR CHEMISTRY & ENERGY ● Nuclear reactions versus chemical reactions ● The process of fission vs fusion. ● Relative energy difference of chemical to nuclear processes. ● Radioactive decay and half-life.	2 weeks	*For Support:* Class notes on Google classroom Videos available on most topics in Homework Sites. Before & After school help as needed. *For Enhancement:* Phet Simulation on Radioactive Decay Modeling the Half-Life of 1st Order Process with pennies Lab,	HS-PS1-8 CRP1,4,6,7,8,9,11,12	*Formative Assessment:* Assigned reading into the concept of fission vs. fusion. In-class debate on the risk/reward on nuclear power. *Summative Assessment* Quiz on the calculation of several half-life related problems.