Englewood Public School District
Science
Chemistry
Fourth Marking Period

Unit 4: Chemistry of Everyday Life

Overview: In this unit of study, *energy and matter* are studied further by investigating the role of acid, bases, oxidation-reduction reactions, electrochemistry, and organic chemistry in the world around us. The crosscutting concepts of *patterns, energy and matter*, and *stability and change* are the organizing concepts for these disciplinary core ideas. Students are expected to demonstrate proficiency in *developing and using models*, *planning and conducting investigations*, *using mathematical thinking*, and *constructing explanations and designing solutions*. Students are also expected to use the science and engineering practices to demonstrate proficiency with the core ideas.

Time Frame: 40 to 45 Days

Enduring Understandings:
Patterns in the structure of a chemical can provide evidence for its relative properties.
The knowledge of the chemical properties of the elements involved can be used to describe and predict chemical reactions.
Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.

Essential Questions:
What does pH measure?
How do chemists use acid-base reactions?
How can electrochemical energy be used?
What are hydrocarbons and why should I learn about them?
What does "organic" mean?

Standards	Topics and Objectives	Activities	Resources	Assessments
(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.**	**Topics** Acids and Bases Oxidation-reduction Electrochemistry Organic Chemistry	Students will complete the investigations, labs, and activities: 1. Watch Untamed Science Chapters 13-18 video introduction via https://www.successnetplus.com/ 2. Titration of Vinegar 3. Lab - PH	**Text:** Pearson Chemistry **Materials:** *See investigations, labs and activities material lists* For Milk of Magnesia Magic • Large beaker (at least 1000ml)	**Formative Assessments:** • Journals • Discussions • Student portfolios will be used to monitor progress. **Summative Assessments:** • Student needs will be

(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-PS1-4)** **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.**	Twenty-First Century Themes and Skills include: • The Four C's • Life and Career Skills • Information and Media literacy **Objectives** Students will: Use the chemical properties of the elements involved to describe and predict the outcome of a chemical reaction. Describe chemical processes, their rates, and whether or not they store or release energy. Construct explanations for how chemical reaction systems change and how they remain stable. Use mathematical representations of chemical reaction systems to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. Describe change of matter and energy in a chemical reaction system in terms of matter and energy flow into, out of, and within that system. Use the periodic table as a model to predict the structure and relative properties of	4. Demo Titration 5. Lab – Titration 6. Oxidation of a Metal 7. Complete an activity series lab 8. Demo a redox reaction 9. Lab - building a wet-cell battery 10. Demo -Electrolysis of water with a Hoffman Apparatus 11. Demo- Electro-plating copper onto a spoon 12. Lab- Formation of Five esters 13. Lab- Formation of Aspirin 14. Lab- Formation of Soap 15. Lab- Formation of [Bakelite] plastic Students will observe the demonstration Milk of Magnesia Magic. Students will participate in virtual labs pH Scale and Acid-Base Solutions. (HS-PS1-5, HS-PS1-1**,** CRP8) Students will watch the videos Acid Base Reactions in Solution, pH and pOH and Buffers, the Acid Rain Slayer to review concepts. (NJSLSA.W2, HS-PS1-2) Students will watch the videos The Strengths and Weaknesses of Acids and Bases and How Batteries Work and participate in an online quiz and discussion.	• Graduated Cylinder, 50ml • Milk of Magnesia, 25ml • Water (tap water can be used), 700ml • Universal Indicator, 5 – 10 ml • Stir Plate and Stir Bar • Household Vinegar, 90ml • Ice cubes (optional) **Websites:** • pH Scale • Acid-Base Solutions • https://www.successnetplus.com/ **Videos:** • Acid Base Reactions in Solution, • pH and pOH • Buffers, the Acid Rain Slayer • The Strengths and Weaknesses of Acids and Bases • How Batteries Work • Electrochemistry • Redox Reactions • Hydrocarbon Power! • Why Don't Oil and Water Mix? **Enrichment Lesson Plans:** See Tree Of Life and Chocolate: The New Health	evaluated after completing The Strengths and Weaknesses of Acids and Bases and How Batteries Work quiz and discussion questions. • Students will receive a grade for the following lab activity conclusions: *Lab – PH*, *Lab – Titration*, *Lab - building a wet-cell battery*, *Lab- Formation of Five esters*, *Lab- Formation of Aspirin*, *Lab- Formation of Soap*, and *Lab- Formation of [Bakelite] plastic*. **Benchmark Assessment:** A Common Formative Assessment will be given at the close of this unit to assess students' mastery of the skills identified. **Alternative Assessments:** • Models/Projects • Graphic Organizers • Simulations • Visual Representations • Research • Drawings • Practice Presentations • Students will develop models based on

	elements. Communicate scientific and technical information about why the molecular - level structure is important in the functioning of designed materials.	(NJSLSA.W5, NJSLSA.R1) Students will watch the videos Electrochemistry and Redox Reactions to introduce the topics. (MP.2, 8.2.12.C.4) Students will watch the videos Hydrocarbon Power! and Why Don't Oil and Water Mix? to introduce organic chemistry. (MP.4, CRP4, 6.1.12.C.3.a) **Enrichment Activities:** Students will explore biological molecules in the Tree Of Life online activity. (N-Q.A.2, HS-PS1-4, 8.2.12.C.5) Students will complete the activities in Chocolate: The New Health Food? Lessons. (N-Q.A.1, CRP6)	Food?		evidence 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. • Students will use simple qualitative models based on evidence to illustrate the scale of energy released in nuclear processes relative to other kinds of transformations.

Accommodations and Modifications:

Students with special needs: Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered.

ELL/ESL students: Students will be supported according to the recommendations for "can do's" as outlined by WIDA – https://www.wida.us/standards/CAN_DOs/. This particular unit has limited language barriers due to the physical nature of the curriculum.

Students at risk of school failure: Formative and summative data will be used to monitor student success at first signs of failure student work will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations. More time and will be made available with a certified instructor to aid students in reaching the standards.

Gifted and Talented Students: Students excelling in mastery of standards will be challenged with complex, high level challenges related to the complexity in planning and carrying out investigations and analyzing and interpreting data.

English Language Learners	Special Education	At-Risk	Gifted and Talented
• Pre-teach vocabulary • Speak and display terminology • Teacher modeling • Peer modeling • Provide ELL students with multiple literacy strategies. • Word walls • Use peer readers • Give page numbers to help the students find answers • Provide a computer for written work • Provide two sets of textbooks, one for home and one for school • Provide visual aides • Provide additional time to complete a task • Use graphic organizers	• Repeat and rephrase directions • Utilize modifications & accommodations delineated in the student's IEP • Work with paraprofessional • Use multi-sensory teaching approaches. • Work with a partner • Provide concrete examples • Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA). • Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).	• Using visual demonstrations, illustrations, and models • Give directions/instructions verbally and in simple written format. Oral prompts can be given. • Peer Support • Increase one on one time • Teachers may modify instructions by modeling what the student is expected to do • Instructions may be printed out in large print and hung up for the student to see during the time of the lesson. • Review behavior expectations and make adjustments for personal space or other behaviors as needed. • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).	• Students act as peer support • Curriculum compacting • Inquiry-based instruction • Independent study • Higher order thinking skills • Adjusting the pace of lessons • Interest based content • Real world scenarios • Student Driven Instruction • Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. • Use project-based science learning to connect science with observable phenomena. • Structure the learning around explaining or solving a social or community-based issue. • Collaborate with after-school programs or clubs to extend learning opportunities.

Interdisciplinary Connections:

ELA-NJSLS/ELA:
NJSLSA.R1: Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. RST.11-12.1 (HS-PS1-5)
NJSLSA.W2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. WHST.9-12.2 (HS-PS1-2), (HS-PS1-5)
NJSLSA.W5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. WHST.9-12.5 (HS-PS1-2)

Mathematics:
MP.2: Reason abstractly and quantitatively. (HS-PS1-5)
MP.4: Model with mathematics. (HS-PS1-4)
N-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. (HS-PS1-2), (HS-PS1-4), (HS-PS1-5)
N-Q.A.2: Define appropriate quantities for the purpose of descriptive modeling. (HS-PS1-4)

Social Studies:
6.1.12.C.3.a: Analyze how technological developments transformed the economy, created international markets, and affected the environment in New Jersey and the nation.

Career Ready Practices:
CRP6: Demonstrate creativity and innovation**.**
CRP4: Communicate clearly and effectively and with reason.
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.

Integration of 21st Century Skills:
9.3.ST-ET.2: Display and communicate STEM information.
9.3.ST.2: Use technology to acquire, manipulate, analyze and report data.

Integration of Technology Standards NJSLS 8:
8.2.12.C.4: Explain and identify interdependent systems and their functions.
8.2.12.C.5: Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts

Planning and Carrying Out Investigations

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS3-4)

Engaging in Argument from Evidence

- Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations). (HS-ESS3-2)

Planning and Carrying Out Investigations

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-ESS2-5)

Constructing Explanations and Designing Solutions

- Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ETS1-3)

PS3.B: Conservation of Energy and Energy Transfer

- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PS3-4)
- Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (HS-PS3-4)

PS3.D: Energy in Chemical Processes

- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (HS-PS3-4)

ESS3.A: Natural Resources

- All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2)

ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. *(secondary to HS-ESS3-2),(secondary HS-ESS3-4)*

ESS2.C: The Roles of Water in Earth's Surface Processes

- The abundance of liquid water on Earth's surface and its unique combination of

Systems and System Models

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-PS3-4)

Structure and Function

- The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials. (HS-ESS2-5)

------ ------------------------

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ESS3-2)

Influence of Science, Engineering, and Technology on Society and the Natural World

- New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ETS1-1) (HS-ETS1-3)

Connections to Nature of Science

Science Addresses Questions About the Natural and Material World

- Science and technology may raise ethical issues for which science, by itself, does not

	physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (HS-ESS2-5) **ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS-ETS1-1) • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. (HS-ETS1-1) **ETS1.B: Developing Possible Solutions** • When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (HS-ETS1-3) • Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her	provide answers and solutions. (HS-ESS3-2) • Science knowledge indicates what can happen in natural systems—not what should happen. The latter involves ethics, values, and human decisions about the use of knowledge. (HS-ESS3-2) • Many decisions are not made using science alone, but rely on social and cultural contexts to resolve issues. (HS-ESS3-2)

	needs. (HS-ETS1-4) **ETS1.C: Optimizing the Design Solution** • Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (HS-ETS1-2)	